INDIAN LOGIC
A READER

Edited by
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Preface

The modern study of classical Indian systems of logic began with H. T. Colebrooke's 'discovery' of the Hindu syllogism – a schema for correct reasoning as described in the early Indian texts. The report of his discovery to the Royal Asiatic Society in 1824 led to a flurry of interest in Indian logic in the next thirty years, attracting the attention even of the best logicians of the time, people like Boole and De Morgan. Interest in the Indian materials was sufficiently great for the celebrated Indologist Max Müller to be asked to contribute an appendix on 'Indian Logic' to one of the standard logic textbooks of the period. The next landmark in the western study of Indian logic was the publication by H. N. Randle of an article on the Indian syllogism in the highly respected philosophical journal *Mind* in 1924. Modern research into Indian logic had to wait, however, until the work of Stanisław Schayer in the 1930s. Schayer was a mathematical logician who trained under Łukasiewicz, the great Polish interpreter of Aristotle's syllogistic theory. Schayer's work on Indian logic marked a turning point, for he brought a detailed knowledge of western logical theory to his interpretation of the Indian systems. His articles are for the first time translated here into English. Further pioneering work was done by Daniel Ingalls, whose book *Materials for the Study of Navya-Nyāya Logic* (1951) is still a definitive treatise, and I. M. Bochenski, whose chapter on Indian logic in his *A History of Formal Logic* (1956) again brought the Indian systems to the attention of western scholars, much as Colebrooke's had a hundred and thirty years before. Frits Staal is widely regarded as a very astute interpreter of Indian logic because of his articles on the topic in the late 1960s

and early 1970s, and since him the work of Sibajiban Bhattacharyya and Bimal Matilal represents the latest research into the subject (indeed, Matilal's last and most penetrating work on Indian logic has only recently and posthumously been published). With their work a modern audience can begin finally to understand the distinctive contours of Indian logic, where it differs from the western theory, as well as where it overlaps, and where its uniqueness and potential lies.

The articles collected here were originally published as follows: [1] Colebrooke, H. T. (1824) "On the Philosophy of the Hindus: Part II – On the Nyāya and Vaiśeshika systems". *Transactions of the Royal Asiatic Society* 1: 92–118. [2] Müller, M. (1853) "Indian Logic". Printed as an Appendix to Thomson, W. (1853), *An Outline of the Necessary Laws of Thought*. 3rd edition. London: Longmans, Green, and Co. [3] Randle, H. N. (1924) "A Note on the Indian Syllogism". *Mind* 33: 398–414. [4] Schayer, St. (1932–3) "Studies in Indian Logic. 1: The Indian and Aristotelian Syllogisms. 2: Ancient Indian Anticipations of Propositional Logic". *Bulletin International de l'Academie Polonaise des Sciences et des Lettres, Classe de Philologie*, Krakow, nr. 4–6: 98–102 (1932) and nr. 1–6: 90–96 (1933). Krakow. Translated into English by Joerg Tuske. [5] Schayer, St. (1933) "Über die Methode der Nyāya-Forschung", in O. Stein and W. Gambert eds., *Festschrift für Moritz Winternitz*: 247–257. Leipzig. Translated into English by Joerg Tuske. [6] Ingalls, D. H. H. (1955) "Logic in India". Entry in the *Encyclopaedia Britannica*, 14th edition, vol. 8: 311–312; reprinted by permission of Encyclopaedia Britannica, Inc. [7] Bochenski, I. M. (1956) "The Indian Variety of Logic", in his *A History of Formal Logic*. Freiburg. Trans. I. Thomas, Notre Dame: University of Notre Dame Press (1961), pp. 416–447. [8] Staal, Frits (1973). "The Concept of Pakṣa in Indian Logic", *Journal of Indian Philosophy* 2: 156–66; reprinted by permission of Kluwer Academic Publishers. [9] Bhattacharyya, S. (1987) "Some Aspects of the Navya-Nyāya Theory of Inference", chapter 17 of *Doubt, Belief and Knowledge* (Delhi: Indian Council of Philosophical Research), pp. 245–267, incorporating the text of his "The Middle Term", *Notre Dame Journal of Formal Logic* 9 (1968); reprinted by permission of the Indian Council of Philosophical Research. [10] Matilal, B. K. (1998). "Introducing Indian Logic", Chapter 1 of Jonardon Ganeri and Heeraman Tiwari, eds., *The Character of Logic in India*, SUNY Press (1998), pp. 1–30; by permission of the State University of New York Press. © State University of New York. All Rights Reserved.

I would like to thank Joerg Tuske both for very ably translating the articles by Stanisław Schayer into English and for bringing his detailed knowledge of Indian logic to bear in helping me plan this volume. I would also like to thank Jonathan Price for commissioning the book for Curzon Press.

Jonardon Ganeri

Introduction: Indian Logic and the Colonization of Reason

Jonardon Ganeri

1 LOGIC EAST AND WEST

In 1955, H. H. Price, who was then the Wykeham Professor of Logic in Oxford, wrote an article entitled "The Present Relations between Eastern and Western Philosophy". He reports there his belief in the existence of a "vast chasm" separating the two philosophical traditions, one of which "looks outward and is concerned with Logic and with the presuppositions of scientific knowledge; the other inward, into the 'deep yet dazzling darkness' of the mystical consciousness" (1955: 222). While the job of the Western philosopher is the analysis and clarification of the concepts which ground scientific enquiry, the Eastern, more particularly Indian, philosopher is said to explore a "mysterious and fundamental sort of self-knowledge", which, though it cannot be literally described, can be "spoken of in paradoxes and parables" (1955: 227). For Price, there is a sharp division of cultural labour: Western and Eastern philosophers are not to be thought of simply as giving different *answers* to the same perennial philosophical puzzles; they can hardly be regarded even as asking the same *questions*.

Price, indeed, gives expression to a dogma, one which by his time had acquired the status of an orthodoxy, but which has its roots in an earlier period. Most likely, it was transmitted to Price, directly or indirectly, by Sarvepalli Radhakrishnan, who lived and taught in Oxford in the late 1930s, and whose representations of India's intellectual past were almost universally and uncritically accepted by his English philosophical audience. According to Radhakrishnan,

Indian philosophy is "essentially spiritual", dominated by the spiritual motive, stimulated by the problems of religion, subjective, speculative and synthetic (1923: 24–30). "The whole course of Hindu philosophy", he says, "is a continuous affirmation of the truth that insight into reality does not come through analytical intellect" (1937 [1977: 65]). His own antipathy towards logic is grounded in his belief that logic has nothing to do with the real purpose of philosophy, namely the attainment of spiritual insight:

> With its profound sense of spiritual reality brooding over the world of our ordinary experience, Indian thought may perhaps wean us moderns from a too exclusive preoccupation with secular life or the temporary formulations in which logical thought has too often sought to imprison spiritual aspirations ("Fragments of a Confession", p. 7).

It is both remarkable and significant that someone as well acquainted with the original sources as Radhakrishnan should propound such a view of Indian thought. For the existence of strong rational, logical and empiricist trends in Indian thought was well known both to nineteenth century European logicians, as well as to Orientalists and historians of logic. The position of those who, like Radhakrishnan and Price, see in Indian philosophy a radically non-European mode of thought, depends therefore on a deliberate choice, one which involves the exclusion of texts dealing with the canons of sound argument, or with the criteria governing rational assent, or with grammar and the philosophy of language, and the promotion of religious and soteriological texts whose theme is the introspective methodology underlying what was called 'the study of the soul' (*ātmavidyā*). As R. Inden, in his recent book *Imagining India*, wryly observes, "To get us to this point [the point at which the Upaniṣads and Vedāntic texts are seen as containing the essentials of Indian philosophy] our guides have already had to make some careful selections" (1990: 101).

I believe that these selections were, to a more considerable extent than is usually recognised, a product of the colonised Indian intellectual struggle for an indigenous, non-European, identity. The devaluation of rationalist elements in Indian philosophical thought arose in part because of 'nativist' trends in the Indian nationalist movement, attempts to find in India's past something radically non-European with which to confront the colonial intrusion. What they found was a Vedāntic system grounded in certain 'fundamental'

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Upaniṣadic texts. Tapan Raychaudhuri, in his study of nineteenth century Bengali attitudes, makes the following observation:

> The emerging nationalist consciousness adopted the heritage of the Hindu culture as the focus of its identity and glorified in the Hindu past. ... Even the secular-agnostic trend in Bengali middle class culture, traceable back to the early days of the Hindu College – if not to the even older tradition of Navya-nyāya [logic] – was subsumed by the ill-defined sense of national identity built around the Hindu heritage and its social body. *A selective veneration for elements of the Hindu culture was thus the cultural bed-rock of the nationalist awareness* (1988:3, my italics).

It is important to stress that this process involved an act of deliberate choice. The spiritual, Vedāntic, past was not there for the taking, but had to be constructed and imposed through a selective promulgation of key texts. Two remarkable passages from the Bengali social reformer Vivekanda throw much light on the mechanisms through which this took place. In the first, he is addressing a Bengali disciple:

> Why do you not set about propogating Vedanta in your part of the country? There Tāntrikism prevails to a fearful extent. Rouse and agitate the country with the lion-roar of *Avaitavāda*. Then I shall know you to be a Vedantist. First open a Sanskrit school there and teach the *Upanishads* and the *Brahma-Sutras*. Teach the boys the system of Brahmacharya. I have heard that in your country there is much logic-chopping of the Nyāya school. What is there in it? Only *Vyāpti* [pervasion] and *Anumāna* [inference] – on these subjects the Pandits of the Nyāya school discuss for months! What does it help towards the Knowledge of the *Atman*? (1902 [1972: Vol. VII, 256–7]).

The second passage is from a speech in Madras:

> Transported from the soil of Mithilā to Navadvipa, nurtured and developed by the fostering genius of Shiromani, Gadādhara and Jadadisha, and a host of other great names, an analysis of the laws of reasoning in some points superior to every other system in the whole world, expressed in a wonderful and precise mosaic of language, stands the Nyāya of Bengal, respected and studied throughout the length and breadth of Hindusthān. But, alas, the Vedic study was sadly neglected, and until within the

last few years, scarcely anyone could be found in Bengal to teach the *Mahābhāshya* of Patanjali. Once only a mighty genious rose above the never ending *Avachchhinnas* and *Avachchhedakas* – Bhagavān Shri Krishna Chaitanya. For once the religious lethargy of Bengal was shaken, and for a time it entered into a communion with the religious life of other parts of India (circa 1895 [1972: Vol. IV, 336–7]).

Vivekananda here gives us a glimpse, albeit ideosyncratic, into the academic life of nineteenth century Bengal. It was a place where logic, grammar and Tantrism were the principal intellectual activities. But for Vivekananda, as later for Radhakrishnan, the study of logic is of no help in that spiritual renaissance which would rejuvenate India. It was necessary, rather, to establish institutions in which the key texts of Vedānta – the *Upaniṣads* and *Brahma-sūtras* – could be taught. The Neo-Hindu movement did not, therefore, involve a "return to the source", as some have argued[1], if by this is meant the rediscovery of a 'native' culture. It needed, rather, to replace one set of sources with another, and to create a new, Vedāntic, culture, which would usurp an already existing intellectual culture grounded in India's logical and grammatical traditions. If, long before the time of H. H. Price, any awareness of these traditions had disappeared, apart from within specialist academic circles, it reflects as much the effectiveness with which 'neo-Hindu' thinkers like Vivekananda, Radhakrishnan, and many others, had managed to impose their own vision of India's philosophical past as it does the romanticism of European Orientalists.

2 COLEBROOKE'S 'DISCOVERY' OF INDIAN LOGIC

The selective occlusion of Indian logic had no serious influence in Europe until the end of the nineteenth century. Prior to this, indeed, awareness of the existence of elements of Indian logical thought was surprisingly widely spread in the West. Nineteenth century perceptions of the logical and 'rationalist' trends in Indian thought among European logicians and historians of philosophy tell a fascinating story of their own. The assumption that the West, and the West alone, had developed a science of reason was a fundamental axiom in the justification of the colonial enterprise as a civilisational process. The gradual emergence of evidence that this assumption was false threatened to expose the more primitive basis of empire in relations of power, domination and economic gain.

European knowledge of Indian rationalist thought[2] centred around the 'discovery' of an Indian science of reason by the pioneer Orientalist and mathematician, H. T. Colebrooke. Colebrooke based his account on an early text, Gautama's *Nyāya-sūtra*[3], and on the Nyāya system to which it gave rise. He reported his discoveries at a public meeting of the Royal Asiatic Society on February 21, 1824. This essay [Essay 1] became the standard reference for the next fifty years, and Colebrooke, through his influence in the Royal Society and the Royal Asiatic Society, and his contacts with such logicians as Boole, Hamilton and De Morgan, was able to generate a great deal of interest in his discovery of the Indian syllogism, not only among Orientalists, but also within the English philosophical community. As Blakey revealingly states in a chapter on "Eastern and Indian Logic", in his 1851 *Historical Sketch of Logic*: "I confess it is chiefly from a compliance with recent custom, that I here offer these few remarks on the systems of logic known in the Eastern nations and in India. I have no doubt of the existence of such logical forms as have of late years been brought prominently forward among European *literati*" (1851: 380).

Colebrooke's lecture was significant for two reasons. First, European philosophers were presented for the first time with Indian materials that unquestionably had as their subject matter ideas and theories closely akin to those of the Greek founders of Western philosophy. Here in these texts were discussions of the categories of being, of the varieties of cause, of space and time, of the nature of proof, of sensation and the functions of the mind. Not only were doctrines adduced, but arguments were given and counter-arguments refuted. In short, the *Nyāya-sūtra* could almost have been a work of Greek philosophy. The belief that this challenged was that Europe, as a consequence of its classical cultural inheritance, had a privileged position of intellectual authority. Second, Colebrooke presented for the first time his 'discovery' of an Indian account of reasoning, and he used the term 'syllogism' to describe it. Unwittingly perhaps, Colebrooke implied that the ancient Indians were as aware of the syllogism as the ancient Greeks. How could it be that the syllogism, the great discovery of the Greeks and one of the key factors to which was due the West's superiority in the development of reason and science, how could it be that this self-same syllogism should have been known also to the ancient Indians? In other words, the problem was whether Colebrooke's discovery could be made consistent with the European self-understanding of its intellectual superiority over its

colonies. This was the critical question Colebrooke's lecture posed and the reason for its significance.

The extent to which Colebrooke's 'discovery' of the Hindu syllogism penetrated the consciousness of these "European literati" can be gauged by a variety of evidence. One of the most widely used logic textbooks of the nineteenth century, Thomson's *Laws of Thought*, carried, from its third edition (1853), until the final reprint of its 5th edition in 1882, an appendix by Max Müller entitled "Indian Logic" [Essay 2]. Apart from an admirably clear discussion of the Hindu syllogism, to which I shall return, Müller here considers what was certainly a very important question of the time, namely, whether India or Greece had obtained its logical theory from the other. He quotes Niebuhr as saying that "if we look at Indian Philosophy, we discern traces of a great similarity with that of the Greeks [which] we cannot explain ... except by the intercourse which the Indians had with the Graeco-macedonic kings of Bactra" (this volume, p. 60). To the Sanskritist Görres, he attributes the view that "Alexander, who had been himself in conversation with the Logicians of India, might have sent some of their treatises to his tutor at home, and Aristotle would have worked them up into a system of his own" (p. 59)! Müller, however, noted that such views were based on questionable assumptions about the antiquity of the Indian texts. He preferred to consider Greek and Indian philosophy to be autochthonic, and concluded that "in philosophy also there is a certain amount of truth which forms the common heirloom of all mankind" (p. 60–1).

References to Indian logic appear in the works from this period by a number of European philosophers. De Morgan reflects awareness of the subject when he remarks that "the two races which have founded the mathematics, those of the Sanscrit and Greek languages, have been the two which have independently formed systems of logic" (1860 [1966:184, fn. 1]). That De Morgan should draw this parallel indicates that he was familiar with Colebrooke's work on classical Indian mathematics, especially the latter's book on Bhāskara's algebra. Indeed, De Morgan went so far as to arrange for the English publication of a work on algebra by a nineteenth century Indian mathematician, Ram Chundra, and, in a lengthy preface, to praise the mathematical sophistication of native Indian thought: "They [the English] forget that at this moment there still exists [in India] a body of literature and science which might well be the nucleus of a new civilisation, though every trace of Christian and Mohammedan civilisation were blotted out of existence" (De Morgan, 1859).

There is evidence, too, that the logician George Boole was acquainted with elements of Indian thought. His wife, Mary Everest Boole, wrote a fascinating article entitled "Indian Thought and Western Science in the Nineteenth Century" (M. Boole, 1901), in which she argued for the thesis that nineteenth century European science "could never have reached its present height had it not been fertilised by successive wafts from the ... knowledge stored up in the East (p. 947)". She claimed, in particular, that George Boole, and the circles in which he moved, were aware of and influenced by Indian philosophical, mathematical, and astronomical, ideas, and she invites the reader to "[t]hink what must have been the effect of the intense Hinduizing of three such men as Babbage, De Morgan and George Boole on the mathematical atmosphere of 1830–1865" (p. 958). Babbage, we may note, was a friend of Colebrooke, and it is more than likely that Colebrooke's 'discoveries' were well-known to the logicians whom Mary Everest Boole cites. As to the effect, if any, the 'intense Hinduizing' of these logicians, one can only speculate. The intriguing possibility is that their awareness that syllogistic logic did not have the unique cultural location it had traditionally been thought to have in some way freed them to think about logic in a new way.

The most influential histories of philosophy from this period, including Ritter's widely read *The History of Ancient Philosophy* (1838), Windischmann's *Philosophie im Fortgang* (1827–34), and Ueberweg's *A History of Philosophy from Thales to the Present Time* (1863), all have chapters on 'Eastern' philosophy, in all of which they discuss the Hindu syllogism. Indeed, if Blakey's remark is anything to go on, it had become virtually *de rigueur* to discuss the Hindu syllogism in any account of the history of logic. As already noted, behind this lay a fascination with the question of Greek-Indian influence, and, in particular, whether the basic idea of syllogistic argument schemas had been transmitted, either from Greece to India, or from India to Greece.

The general impression is that a certain knowledge of Indian logical theory was 'in the air' in the mid-nineteenth century, and that it was considered to be a topic worthy of serious, even if critical, discussion.

3 THE SYLLOGISTIC INTERPRETATION OF INDIAN LOGIC

Note, however, that Blakey's grudging inclusion of such Eastern "systems of logic" into his history is dictated, not by a willingness to

admit that there is anything of value to be found in them, but rather out of deference to fashion. He continues:

> I have a great doubt of such logical views becoming of any value whatever in the cause of general knowledge or science, or of ever having any fair claim to be admitted as an integral part of the Catholic philosophy of mankind It is absurd to conceive that a logic can be of any value from a people who have not a single sound philosophical principle, nor any intellectual power whatever to work out a problem connected with human nature, in a manner that is at all rational or intelligent. Reasoning, at least in the higher forms of it among such semi-barbarous nations, must be at its lowest ebb; nor does there seem to be any intellectual stamina, in such races of men, to impart to it more vigour and rationality (1850: 380)

If by 1853, Max Müller went so far as to ask "the Brahmans themselves [to] take up the gauntlet and defend their Logic against the attacks of European critics" (this volume, p. 74), it was a reflection as much of the failure of the philosophically untrained Orientalist scholars plausibly to interpret the 'Hindu syllogism' as it was of the negative reaction of many British and German logicians and historians of philosophy to the idea of an origin of logical enquiry other than Greek.

Indeed, most of the objections leveled by these critics follow immediately from the hasty reductive comparison of the Nyāya analysis of sound reasoning with syllogistic schemata, a comparison implicit in the very phrase "Hindu syllogism". Colebrooke describes the *Nyāyasūtra* analysis of an argument schema as follows (this volume, pp. 47–8):

> A regular argument or syllogism (*nyāya*) consists of five members (*avayava*) or component parts. 1st, the proposition (*pratijñā*); 2nd, the reason (*hetu* or *apadeśa*); 3rd, the instance (*udāharaṇa* or *nidarśana*); 4th, the application (*upanaya*); 5th, the conclusion (*nigamana*). Ex
>
> 1. This hill is fiery:
> 2. For it smokes.
> 3. What smokes is fiery: as a culinary hearth.
> 4. Accordingly, the hill is smoking:
> 5. Therefore it is fiery.
>
> Some confine the syllogism (*nyāya*) to three members; either the three first, or the three last. In this latter form, it is quite regular.

> The recital joined with the instance is the major; the application is the minor; the conclusion follows ..

The most influential of the 'European critics' to whom Müller refers, was without doubt H. Ritter. His 1846 *History of Philosophy* contained a chapter entitled "Oriental Philosophy, and its Influence on the Grecian". Indian philosophy, according to Ritter, "has an irresistible claim on our attention", which it attracts to a lesser extent than Greek philosophy "only because its ideas have not entered in such extensive and therefore influential combinations into the present development of science (p. 332)". When it comes to the Nyāya, however, this generous assessment is qualified or withdrawn:

> One point alone appears certain, and that is, that they [the Nyāya] can lay but slight claims to accuracy of exposition. This is proved clearly enough by the form of their syllogism, which is made to consist of five instead of three parts. Two of these are manifestly superflous, while by the introduction of an example in the third the universality of the conclusion is vitiated (p. 365).

Irritated probably by the haphazard ordering of the sections in such an ancient and diachronic text as the *Nyāyasūtra*, he grumbles that "in its exposition the Nyāya is tedious, loose and unmethodical. Indeed the whole form of this philosophy is a proof of the incapacity of its expositors to enter into the intrinsic development of ideas, whatever knowledge they may have possessed of the external laws of composition" (p. 366). Ritter's sources, we may note, are Colebrooke (he cites the passage above in a footnote), and Windischmann, whose view he reports thus: "Windischmann concludes that the Hindoos possessed only the fundamental principles of the logic which the Greeks cultivated" (p. 366).

Ritter's comments are representative of European reactions to the Hindu syllogism in the nineteenth century. Accepting that Indian logic is indeed syllogistic, the Indian version of the syllogism is found wanting in two respects. First, of the five steps, two are 'manifestly superfluous'. For in a properly formulated syllogism, the conclusion, that the hill is fiery, follows from two premises, a *minor* premise, that the hill is smoky, and a *major* premise, that whatever has smoke also has fire. When it is construed as setting out the premises and conclusion of a deductive argument, the Indian schema indeed looks as if it is but a repetition of the same reasoning, in which the conclusion is first stated followed by the premisses, and again the premisses stated

followed by the conclusion. That is the opinion of the emminent logician, Sir William Hamilton, who refers to the "Hindu syllogism" in the appendix entitled "Of Syllogism" to his *Discussions on Philosophy* (1852): "The Hindu syllogism is merely a clumsy agglutination of . . . counter-forms, being enounced, 1st, analytically, 2nd, synthetically."

Apologists for the Nyāya were quick to point out that this criticism depends on a radical misconstrual of the point of the five-step format, whose function, they said, is not to present the premises and conclusion of a formal deduction, but to describe the correct form for conducting a debate. It is to be thought of as a sort of question-and-answer session, with one side advancing a thesis, and the other interrogating him or her. As Ballantyne put it in his lengthy reply to Hamilton, "the five-membered exposition [is not] the Hindu syllogism at all, but the Hindu rhetorical exposition" (1859: 149). If the five-step format is understood as a stylised representation of the stages in a rhetorical debate, then it exhibits "a more natural mode of reasoning than is compatible with the compressed limits of the syllogism" (vans Kennedy, 1839). The presence of five, rather than three, steps, is natural, they suggest, when we recall that each step is a response to a silent interlocutor:

(1) What is your thesis? That the hill has fire on it.
(2) Why? Because there is smoke there.
(3) So what? Where there is smoke, there is fire: e.g. the kitchen.
(4) And? The hill is such a smokey place.
(5) So? Therefore, it has fire.

Rather than judging Indian logic as if it aspired to be syllogistic, and then finding it wanting, the new suggestion is that Indian logic is not syllogistic at all, but has a quite different and distinctive function. Max Müller cautions that "We might have clothed Kaṇāda in a Grecian garb, and made him look almost like Aristotle but what would we have gained by this? All that is peculiar to Indian Philosophy would have been eliminated, and the remainder would have looked like a clumsy imitation of Aristotle" (1853: 294–5). Nevertheless, the impression remained that the Indian analysis of the reasoning process was clumsy and imprecise, and that the Indian philosophers were unable, with any accuracy, to articulate the essentials of a properly formulated argument (cf. Blakey, 1851: 385).

The citation of an example in the third step only served to reinforce this impression, and to encourage those critics for whom Indian

rational processes never moved beyond the level of the analogical. The exact meaning of Ritter's assertion, that the introduction of an example vitiates the universality of the conclusion, is not entirely clear, but apparently implies that the inference proceeds from particular to particular without the intervention of such a generalisation as would be expressed by the major premise in a syllogism. A. B. Keith was later to claim that "the fact that reasoning can only proceed by means of a general proposition had not yet been appreciated in the [Nyāya] school, for this reasoning still was from particular to particular by analogy (1924: 87)". Others objected that the example was simply superfluous: the evaluation of an argument as valid or invalid in no way depends on the citation of an instance of the major premise.

Once again, authors like Ballantyne, Müller and Röer strove to show that the citation of an example had a legitimate point. Ballantyne relied once more on the distinction between logic and rhetoric, claiming that the example helped to convince one's dialectical opponent of the truth of the general rule. For Müller, the function of the example was to indicate what he called the 'modality' of the general rule. He noted that Indian logicians distinguish between three kinds of such rule: those whose antecedent holds over the whole domain ("Whatever is nameable is knowable"); those whose antecedent holds over only part of the domain ("Whatever has smoke has fire"); and those whose antecedent holds over none of the domain ("Anything except earth which is different from the elements other than earth has odour")[4]. According to Müller, the example indicates which kind of rule is being employed in the third step.

Röer took yet another tack. Relying on the distinction between valid and sound inference, he argued that "the Nyāya wanted not only to give rules for the correctness of the logical operation, but to guard against false premises" (1850: xxiii). Citing an example could then be seen as a gesture in the direction of an inductive confirmation of the major premise, upon whose truth the soundness of the inference rests.

For my present purpose, which is to reconstruct European perceptions of Indian rationalist thought, it is unnecessary to evaluate the relative merits of these hypothetical justifications of the inclusion of an example. I would like instead to point out an irony here. Of all the philosophers of the nineteenth century, J. S. Mill was one of the most influential. He became famous, in particular, for his critique of syllogistic reasoning, namely that, since the major premise "all men are mortal" already 'includes' the conclusion "Socrates is mortal", the premises of a syllogism already assert what they are supposed to

prove. The real grounds for the inference, he claimed, were just the observed instances on which our belief in the major premise rests, and therefore inference is from particular to particular, in which, as he puts it, the major premise is just a "memorandum" of previously observed instances. Mill's doctrine seemed to the Western expositors of Nyāya to be very similar to the Indian pattern of inference, with its emphasis on citing examples, and they constantly, and perhaps aptly, referred to his theory in their expositions. Mill himself, however, though he worked as a Indian colonial administrator for most of his life, never once refers to the Indian syllogism or to the Indian rationalist schools, though he was certainly acquainted with the Orientalists, like Ballantyne, who promoted them.

The fullest diagnosis of the syllogistic interpretation of Indian logic is to be found in H. N. Randle's article of 1924 [Essay 3]. Remembering that Indian logicians insist on both positive and negative examples of the concomitance relation, Randle records the Indian syllogism as having a form such as the following (this volume, pp. 76–7):

1. That hill is on fire.
2. Because it is smoking.
3. As smoke and fire go together, on the hearth, while non-smoke and non-fire go together, in the lake.
4. So here: [or, so *not* here:]
5. Therefore is that hill so, i.e. on fire.

The syllogistic interpretation now represents this inference pattern as a combination of a syllogism in *Barbara* with a syllogism in *Cesare*:

All that is smoky is fiery
This hill is smoky
Therefore, it is fiery

and

Nothing that is not-fiery is smoky
This hill is smoky
Therefore it is not non-fiery, i.e. it is fiery.

As soon as this reductive interpretation is accepted, the three classical objections can be given: (1) that one of these syllogisms is unnecessary, (2) that the two examples are superfluous, and (3) that the first two members are identical with the last two and serve no purpose. In rehearsing the standard defences of the Indian 'syllogism' – that it functions rhetorically as a device of demonstration, that the

examples inductively support the major premise in both its standard and contraposed form – one implicitly commits oneself to accepting as correct the syllogistic interpretation. Yet it is the very acceptance of that interpretation which made it inevitable that Indian logic should seem impoverished in comparison with its Greek counterpart. Randle himself, however, is at pains to emphasise the distinctiveness of the early Indian 'syllogism' arising from its emphasis on cases or examples in the process of reasoning.

4 INDIAN LOGIC AND CULTURAL STEREOTYPES

While some European philosophers and historians of philosophy were content simply to criticise the Indian analysis of a reasoned argument as a clumsy version of the syllogism, others, influenced primarily by Hegel, looked for a wider historical perspective. The German historian of philosophy, Ueberweg, while noting that "to the authors of the Nyāya doctrine . . . the Syllogism was known", dismissed Indian philosophy thus:

> Philosophy as a science could [not] originate among the Orientals, who, though susceptible of the elements of high culture, were content simply to retain them in a spirit of passive resignation" (*History of Philosophy*, 1863–6).

This idea, that 'Oriental' philosophy was tradition-bound and hence static and unoriginal, was echoed by yet another historian of philosophy, Windelband:

> As was natural in consequence of the peculiar restraint of the Oriental mind, they lacked for their fruitful and independent development, the initiative activity of individuals (*A History of Philosophy*, 1891).

Here, then, was an explanation of the Indian thinkers' alleged failure to develop a properly scientific conception of philosophy. Though they stumbled across the patterns of syllogistic reasoning, their traditionalist habits of mind stopped them from turning it into the basis of a methodical system of logic. "The foundation of logic as a science", says Ueberweg, "is a work of the Greek mind, which equally removed from the hardness of the Northern and the softness of the Oriental, harmoniously united power and impressibility" (*System of Logic*, 1857). Even Röer, whose analysis of the Nyāya was one of the most sophisticated of the time, subscribed to a version of this myth:

> That Hindu philosophy will have any great influence on the development of European philosophy and mediately of European civilization must be denied. You are compelled to think by reading the works of the Greeks, they introduce you into the process of their thoughts, and by this force you to accompany them with your own thoughts, until you arrive as it were by your own mind at the principles of their systems ... The Hindus, on the other hand, are dogmatical. They commence synthetically with a statement of their principles, yet do not condescend to unfold the train of thought which has led them (1850: iv–v).

This "inherent fault" in the mode of exposition of the Indians' philosophical texts "perhaps, more than anything else, contributed to the narrow limits of their mental horizon".

The picture then was of Indian rationalist thought as moribund, and in particular of the Indian syllogism as a clumsy, barnacled version of its proper, Aristotelian form. This picture lay behind the endeavours even of those Orientalists like Ballantyne, who thought they could perceive in the Nyāya system the beginnings of a scientific conception of philosophy. As head of the Sanskrit College in Benares, Ballantyne inherited from another Scottish Orientalist, Muir, the programme of educating intelligent brahmins by translating Christian and Western philosophical texts into Sanskrit. The students at this college were looked upon to disperse European ideas among their countrymen by "inculcating the mass with the knowledge of the West", as Ballantyne put it. Ballantyne's educational approach was based on what later became called the concept of 'fulfilment', the idea that Indian religious and philosophical doctrines should not be directly refuted, but instead developed and improved until they resembled their European counterparts. "The method which I have found to answer best", says Ballantyne, "is to take as a starting point some established point in their own philosophy, and to show how the philosophers of Europe have followed up the enquiry" (1852, p. xi). To this end, Ballantyne composed in Sanskrit his *Synopsis of Science*, which, though deriving its arrangement and style from the *Nyāya-sūtras*, was meant to be "a consistent digest of European knowledge for the use of India". Within this text, the treatment of inference acquired special importance, for

> our modern conception of Induction being that to which is particularly to be attributed our superior progress in science, it

> appeared highly important ... that the Hindu speculations on the subject should be carefully investigated.

Thus even Ballantyne, who was the first to produce good translations of Indian logical texts, and who defended the Nyāya system whenever he found it criticised (cf. Ballantyne 1848, 1849, 1859), ultimately saw the Indian account only as a transitional step from which to develop to a more sophisticated, European mode of scientific knowledge.

5 THE FORMALISTIC INTERPRETATION OF INDIAN LOGIC

It was only with the work of Russell and Łukasiewicz in the development of mathematical logic that new interpretations of Indian logic became possible. The pioneer in this field was Stanisław Schayer, himself a pupil of Łukasiewicz and a keen logician, in addition to being an Indologist of extraordinary ability. Schayer observed a number of fundamental structural features that vitiated the attempt to give a syllogistic reading to the Indian model, whether the syllogism was understood in the traditional way of the nineteenth century or the new ('authentic') way as propounded by Łukasiewicz [Essays 4 and 5]. The key features were, first, that the so-called minor term in the Indian model was singular and not general, and second, that the Indian pattern is not restricted to propositions in the A, E, I and O forms; in particular the third step in the Indian pattern, namely "wherever there is smoke there is fire" or "whatever possesses smoke possesses fire" is not a proposition of such a form. So he concluded that "under no circumstances can we force the Indian syllogism onto the Procrustean bed of the authentic Aristotelian syllogism. Likewise, only with great difficulties can we view it through the grid of the 'traditional' syllogism. We can only do justice to the meaning and possibilities of development of the Indian syllogism by seeing it as a prescientific anticipation of some forms of inference which we know from modern logic. Indology has to rid itself from the false suggestion that the Aristotelian or the traditional syllogisms provide a suitable basis for the interpretation of problems in Nyāya philosophy" (Essay 4, p. 5).

Schayer's new idea was to see the Indian 'syllogism' as really a proof exploiting two rules of inference. He represented the five steps in this way [Essay 5 this volume, pp. 94, 106]:

1. thesis	Fa	There is fire on a (= on this mountain).
2. reason	Ga	There is smoke on a.
3. statement of pervasion	$(x)(Gx \rightarrow Fx)$	For every locus x: if there is smoke in x then there is fire in x.
4. application	$Ga \rightarrow Fa$	This rule also applies for $x = a$.
5. conclusion	Fa	Because the rule applies to $x = a$ and the statement Ga is true, the statement Fa is true.

Two inference rules are in play here – a rule of *substitution*, allowing us to infer from '$(x)\zeta x$' to 'ζa', and a rule of *separation*, allowing us to infer from '$\theta \rightarrow \varphi$' and '$\theta$' to '$\varphi$'. Schayer thereby identifies the Indian syllogism with a proof in a natural deduction system:

Thesis: Fa because Ga.

Proof:	(1) Ga	Premise
	(2) $(x)(Gx \rightarrow Fx)$	Premise
	(3) $Ga \rightarrow Fa$	2, by $\forall$ Elimination
	(4) Fa	1 & 3, by $\rightarrow$ Elimination. QED.

Schayer's interpretation has proved to be rather influential, and is substantially endorsed by both Daniel Ingalls [Essay 6] and I. M. Bochenski [Essay 7]. It might indeed itself be criticised for distorting the proper form of a *nyāya* argument schema. Ingalls objects, for example, that "[t]he translation of the third member as '$F(x) \supset G(x)$' may refer to the same facts in a given instance as the Indian original, but the facts are not arranged in the Indian way. The letter F refers by an indissoluble expression to two notions which are quite distinct to the Indian logician: the *hetu* and the relation by which the *hetu* occurs" (this volume, p. 112). In pressing the Indian schema into the form of a natural deduction, something of its true nature has been lost. In particular, the characteristic function of the 'example' has been reduced to a 'statement of persuasion'. That being so, much more of the true form is preserved than on the syllogistic interpretation. The key difference between the Aristotelian and the Indian syllogisms is now seen to reside in the nature of the terms involved. Unlike the Aristotelian syllogism, whose major, middle and minor are classes, the Indian schema has as its 'field' (*pakṣa*) a single individual, in which there occur two properties, the property that serves as a 'reason' (*hetu*) and the property that is 'to-be-inferred' (*sādhya*). Another difference emphasised in Schayer's presentation is

the insistence that while the Aristotelian syllogism is a thesis, the Indian syllogism is a combination of inference rules. The Aristotelian syllogism, it is held, is a thesis of the form "if all A are B, and all B are C, then all A are C." The Indian syllogism, on the other hand, is a inference based on two rules, substitution and separation.

Bochenski sums up the new 'formalistic' interpretation of the Indian syllogism as follows [this volume, pp. 142–3]:

> If we disregard the psychology, which here plays a considerable part, these points come to light:
>
> (1) The Indian syllogism is not a thesis, but a rule, like the Stoic and Scholastic syllogisms.
> (2) Structurally it is Ockhamist rather than Aristotelian, since the 'reason' always corresponds to a singular proposition.
> (3) Yet the formulation rather suggests a formula of modern mathematical logic, than an Ockhamist syllogism, viz.:
> For all x: if x is A, then x is B;
> but a is A;
> Therefore a is B.
> (4) The Indian formula also contains an express justification of the major premiss. In this respect there seems to be a difference between the classic Nyāya logicians and the *Tarkasaṃgraha*. The latter, and later, text fairly evidently envisages an inductive proof, while the earlier thinkers intuit the connection of two essences in an individual.
> (5) It should be evident that we are still in a logic of terms.
>
> Modest as these results may seem to a western logician, the text undoubtedly attains to the level of genuine formal logic, though it is very far from being formalistic.

The fourth of these points refers to the role of 'examples' in the Indian schema, cited cases of things that are both A and B, and of things that are neither A nor B. The continuing importance of examples in Indian style proofs is an embarrassment for the formalistic interpretation, which can only say that their role is to give inductive support to the universal premise. Forgetting the point, made so long ago by Max Müller and repeated by Schayer himself, that if the Indian syllogism is not judged in its own terms it is bound to appear to be a clumsy version of whatever logic is being used to judge it, Bochenski can find in Indian logic only a modest anticipation of formal logic, and fails to discover a genuinely different theory. It is seen, not as a sophisticated attempt to



solve its own problems, but as an impoverished attempt to solve ours. All this tells us a great deal about European perceptions and preoccupations, and rather less about the true nature of Indian logic.

6 THE PROPERTY-LOCATION INTERPRETATION OF INDIAN LOGIC

The formalistic interpretation improved on the syllogistic interpretation of the Indian schema in recognising that terms in Indian logic are not general names denoting classes, as the minor, middle and major terms are. The alternative in the work of Schayer and Bochenski is to translate the Indian schema into a predicate logic, wherein one term is an individual constant (e.g. 'the mountain') and the other two are predicates (e.g. 'is smokey', 'is fiery'). Critics of this interpretation pointed out that the underlying model in the Indian schema is based on the concept of 'occurrence' or 'location', specifically the occurrence of the properties smokiness and fieriness in the 'ground' of the inference, the mountain. So the terms are not predicates but names of properties. Frits Staal bases his reconstruction [Essay 8] on a primitive relation 'A (x, y)', standing for 'x occurs in y' or alternatively 'y is the locus of x'. If 'p' denotes the *pakṣa* or 'ground' of the inference, 'h' the *hetu* or reason property, and 's' the *sādhya* or 'to be inferred' property, then the schema is now represented as:

A (h, p)
s pervades h
therefore, A(s, p).

The Indian schema is now seen as depending on two relations, one between properties and locations, the other between properties and properties. That is, as Staal observes, quite different from the Aristotelian syllogism in which a relation of 'belongs to' relates classes (as in 'mortality belongs to all men').

Many of the characteristic features of Indian logic can now be explained as deriving from peculiarities in the behaviour of the relation of occurrence, or its converse, possession. Sibajiban Bhattacharyya [Essay 9] and Bimal Matilal [Essay 10] both pursue this line of enquiry, developing Indian logic as a logic of property possession. Bhattacharyya observes that a 'property' in the Nyāya sense must be taken to be anything that occurs in or on something else; in this sense the table is a 'property' of the ground on which it stands. Much of the technical development of logic in later Nyāya can

be seen as an attempt to wrestle with the complexities induced by such notions of property and property-possession. When, for example, one infers that the mountain is fire-possessing, what property is it that the mountain is inferred to have? The rule in Navya-Nyāya, according to Bhattacharyya, is (this volume, p. 164) –

> To determine s [*sādhya*] of an inference, (i) drop the suffix '-possessing' when it occurs in the second term of the sentence stating the conclusion; (ii) add the suffix '-ness' to it when the suffix '-possessing' does not occur.

So the property the mountain is said to possess is *fire* – fire in general as distinct from either the universal fireness or a given particular fire. Clearly, this is an idea at some remove from the theory of the syllogism or from anything in first-order logic. Ingalls foresaw the point in his reservation about the formalistic interpretation. One should not be too hasty in one's attempt to identify an entity in logic with which to identify the Nyāya property *fire*.

Matilal's proposal is to interpret the Indian schema as a theory of substitution, "where one property, by virtue of its logical relation with another property, forces the substitution of the latter in its place" (this volume, p. 205). The schema for him is best represented as:

p has h pervaded-by-s
therefore, p has s.

To make sense of the schema, Matilal suggests, we ought not to see its propositions as having a subject-predicate structure at all (as the formalistic interpretation presumed). Instead, we are to think of the individuation of a property as akin to the individuation of a stuff (p. 208):

> Consider a thought experiment. We may mentally integrate the individually located water stuff in this world into a spatially integrated whole. "Water" then becomes a singular term referring to this whole, which has a spatio-temporal spread. Then to talk about the water in this glass we can delimit the stuff by its spatio-temporal location. We can likewise conceptually integrate all the different abilities to swim that are found in various agents into a 'conceptual spread,' and to talk about John's ability to swim, we can delimit this abstract feature, the ability to swim, by its spatio-temporal location, in this case, John.

The language of Indian logic, Matilal suggests, is a feature-placing language. The sentence "the mountain is fire-possessing" assigns a spatio-temporal location to the stuff *fire*. We might indeed think of the term 'fire' here as adjectival, but only if we are willing to classify adjectives along with mass terms, rather than with sortal terms. For sentences like "the mango is sweet" and "the glass is filled with water" both locate a feature at a place. In the first case, the feature located is sweetness, and in the second it is water; and this is as predicted by the rule Bhattacharyya cites, for one first translates the second sentence into "the glass is water-possessing," and then exploits the reciprocity of the operations of substantivization and use of the possessive suffix to identify 'water-possessing-ness' with 'water'. In sum, the object with which one must identify the Nyāya *fire* is neither any particular body of fire nor the universal fireness, but the stuff feature fire-presence.

Matilal's formulation suggests another important departure from earlier interpretations. The 'universal rule' (wherever *h*, there also *s*), it seems, need no longer be thought of as an enthymematic premise, but rather as a background precondition for the property substitution to take place. The substitution 'trades' on the pervasion of *h* by *s*, perhaps in a manner akin to the way an inference from '*Fa*' and '*Ga*' to '*(F&G)a*' trades on the identity of the referents of '*a*' in the first and second premises (the point being that this identity could not itself be introduced as an enthymematic premise in the inference, for that would only introduce new tokens of '*a*', on whose coreference the inference would again trade). It is clear that a logic developed along these lines has no easy reduction to syllogistic or subject-predicate forms. It will have to develop its own techniques for the treatment of quantification, and the domain in which it has an application will not coincide with other logical theories, for it will be better suited for formalising and solving some problems, and less so for others. The task for a modern interpreter of Indian logic is to understand the distinctive *problematic* within which Indian logic developed, and to evaluate the theory within that context.

7 CONCLUSION

At the beginning of this paper, I observed that Indian philosophy came to be synonymous with the speculative, spiritual and non-rational. It is not, as we have now seen, that India did not have rationalist and scientific traditions, nor that European philosophers in the nineteenth

century were unaware of them. Yet, initially favourable responses, among European intellectual circles, to reports of Indian contributions to logic, and enthusiasm for the idea that logic had its origins as much in India as in Greece, gave way to a more sceptical and dismissive evaluation of the Indian material. This change in attitude had its roots, perhaps, in the passing of Europe's 'Oriental Renaissance', and a harder, utilitarian approach to the government of its Eastern colonies[5].

The idea that Indian philosophy is 'essentially spiritual', though still all too prevalent, has been shown to be a myth by authors such as Daya Krishna, J. N. Mohanty and B. K. Matilal. What I have tried to do here is to uncover some of the *methods* and *mechanisms* of this myth. It has become something of a commonplace to say that such myths are the result of European invention, of the West's desire to discover its 'other' in the East. Yet those nineteenth century European scholars who took their inspiration from the work of Colebrooke, did try to analyse Indian logical theory with clarity and insight. Though limited both by their lack of acquaintance with important texts, and by the methods of logical analysis then available to them, they engaged in a certain kind of 'comparative philosophy' which is still practiced today. Colebrooke, I think, deserves recognition for attempting to set comparative philosophy on a secure methodological basis, as William Jones had earlier done for comparative linguistics.

What we can see, however, is that any comparative project is liable to catch the Indian theory in a double-bind: either Indian logic is not recognised as logic in the western sense at all; or if it is, then it inevitably appears impoverished and underdeveloped by western standards. The only way to escape this dilemma is to reclaim for Indian logic its own distinctive domain of problems and applications, to see how it asks questions not clearly formulated elsewhere, and in what way it seeks to solve the problems it sets for itself. Let me quote in this connection a modern philosopher's explanation of the importance of studying alternative philosophical traditions (Rosen, 1998: 664):

> Historians of philosophy writing in English typically construct their arguments as if the authors whom they are discussing were all taking part in a single argument – an argument that is conducted in terms of those problems that we now recognize to be relevant. This appears to leave no place for those who do not share our current assumptions regarding the nature of the issues

– who lie outside what we think of as 'our tradition.' Yet what is the alternative? Unless we can situate the authors whom we study in relation to our own concerns, what philosophical value (rather than value of a historical, biographical, or sociological kind) is there in engaging with them?

Fortunately, this apparent dilemma rests on a misunderstanding. Philosophy is not a discipline carried on according to rules and assumptions fixed once and for all. On the contrary, it has always involved an attempt to examine and call into question ideas and commitments that are otherwise taken for granted. Thus we do not need to share assumptions with the authors whom we study (or worse, pretend that we share them when we do not) in order to include them in our discussion. Indeed, it may be the very fact that authors proceed from an underlying position very different from our own that makes studying them valuable: the difference challenges us to reflect on commitments that we would otherwise not even realize that we had. The problem is to explain the distinctiveness of the author's own concerns in sufficient detail to make them intelligible and to find enough common ground to make the challenge that they represent a productive one.

This is said in defence of the study of continental philosophy, but it holds just as well for research into 'subcontinental' philosophy. The effort must continually be made to explain the distinctiveness in the goals, methods and techniques of Indian logic, in order that we might better understand the nature of the challenge that this alternative tradition of inquiry into the basis of reasoned thought presents, most particularly when we assume that our own theories are free from commitments specific to our own history

NOTES

1 C.f. K. N. Panikkar (1986: 416, and S. Gopal. (1989, intro.) Gopal, Radhakrishnan's biographer and son, tries to use Amilcar Cabral's notion of a "return to the source" in order to explain Radhakrishnan's attitudes towards Indian philosophy. But he tacitly accepts that there is some one body of texts which constitute this source. Note too that, as originally used by Cabral, the concept of a return to the source refers not to the rediscovery of a past, textually-grounded, tradition, but to a return to the folk culture of the masses (c.f. A. Cabral, 1973: 63: "The return to the source ... is denial by the petite bourgeoisie of the pretended supremacy of

the culture of the dominant power over that of the dominated people with which it must identify itself"). Yet in this sense too the neo-Hindu 'Vedāntism' is not a "return to the source", for the nineteenth century culture of the masses, as Vivekananda himself indicates, was not Vedānta but Tantrism, in Bengal at least.

2 In this introduction, I will use the term 'rationalism' in opposition with such terms as 'spiritualism' or 'subjectivism'. By 'Indian rationalist thought', I have especially in mind the Nyāya school of Indian philosophy, which was the object of most nineteenth century interest in the West. The logical texts of the Buddhists, so central to the development of logic in India, were only rediscovered at the end of the nineteenth century, when Vidyabhusana went on his pioneering searches in Tibet. Their theories are also extensively discussed in the articles in this volume, especially essays 4, 6, 7, 8 and 10.

3 The date for the composition of the *Nyāyasūtra* is now placed between 200 B.C. and 150 A.D. It is the foundational text for the Nyāya school, forming the basis of many commentaries and original treatises. In the thirteenth century, the school underwent a major reform, acquired the new name 'Navya-nyāya', and began to develop a technical language of great precision. Incidentally, the terms "*avacchedaka*" (delimitor) and "*avacchinnna*" (delimited) are among the logical primitives of this language.

4 These were called '*kevalānvaya*', '*anvaya-vyatireka*', and '*kevala-vyatireka*'. See essay 10

5 Cf Majeed, *Ungoverned Imaginings: James Mill's 'A History of British India' and Orientalism*, (1990). James Mill's influence on the study of Indian thought is noted by Kejariwal: "James Mill, now [1834] an important official in the India Office, was beginning to influence policy on India. In his reply to a despatch containing a proposal to improve the Hindu College at Benares and the Mohammedan College in Calcutta, Mill severely remarked: 'In professing to establish seminaries for the purpose of teaching mere Mohammedan literature, the Government bound itself to teach a great deal of what was frivolous, not a little of what was purely mischievous, and a small remainder indeed in which utility was in any way concerned. The great end of Government should be, not to teach Hindu or Mohammedan learning, but useful learning'" (Kejariwal, 1988: 167). There are, of course, clear parallels here with Macaulay's 1835 "Minute on Indian Education" (see Shah 1990).

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Chapter 1

The Philosophy of the Hindus: On the Nyāya and Vaiśeṣika Systems[1]

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In the preceding essay, the *Sāṃkhya*, theistical as well as atheistical, was examined. The subject of the present essay will be the dialectic philosophy of Gotama,[2] and atomical of Kaṇāda,[3] respectively called *Nyāya*[4] "reasoning," and *Vaiśeṣika* "particular." The first, as its title implies, is chiefly occupied with the metaphysics of logic; the second with physics: that is, with "particulars" or sensible objects; and hence its name.[5] They may be taken generally as parts of one system, supplying each other's deficiencies;[6] commonly agreeing upon such points as are treated by both, yet on some differing, and therefore giving origin to two schools, the *Naiyāyika* and *Vaiśeṣika*.

From these have branched various subordinate schools of philosophy; which, in the ardour of scholastic disputation, have disagreed on matters of doctrine or of interpretation. The ordinary distinction between them is that of ancients and moderns; besides appellations derived from the names of their favourite authors, as will be more particularly noticed in another place.

The text of Gotama[7] is a collection of *sūtras* or succinct aphorisms, in five books or "lectures," each divided into two "days" or diurnal lessons; and these again subdivided into sections or articles, termed *prakaraṇas*, as relating to distinct topics. It is a maxim, that a section is not to consist of so little as a single *sūtra*; and to make good the rule, some stress is occasionally put upon the text, either splitting an aphorism or associating it incongruously.

Kaṇāda's collection of *sūtras* is comprised in ten lectures, similarly divided into two daily lessons, and these into *prakaraṇas*, or sections, containing two or more *sūtras* relative to the same topic.[8]

Like the text of other sciences among the Hindus, the *sūtras* of Gotama and of Kaṇāda have been explained and annotated by a triple set of commentaries, under the usual titles of *Bhāṣya*, *Vārttika* and *Ṭīkā*. These (the *Bhāṣya* especially) are repeatedly cited by modern commentators, as well as by writers of separate treatises; but (so far as has come under my immediate notice) without naming the authors; and I cannot adventure, having no present opportunity of consulting the original scholia in a collective form, to assign them to their proper authors, from recollection of former researches.[9]

They are of high authority, and probably of great antiquity; and it frequently becomes a question with the later commentators, whether a particular passage is to be taken for a *sūtra* and part of the text, or for a gloss of the ancient scholiast.

Commentaries which are now at hand, and which have been consulted in the course of preparing the present treatise, are the *Vārttika-tātparya-pariśuddhi* of the celebrated Udayana-ācārya, and the Vārttika-tātparya-ṭīkā of the no less celebrated Vācaspati-miśra. The more modern scholia of Viśvanātha upon Gotama's text, and Śankara-miśra upon Kaṇāda's, are those to which most frequent reference has been made for the present purpose.

Separate treatises of distinguished authors teach, and amply discuss, the elements of the science. Such are the *Nyāya-līlāvatī* of Vallabha-ācārya,[10] following chiefly Kanāda's system.

An easier, and more concise introduction than these abstruse and voluminous works afford, is found requisite to the initiatory study of the science. One of the most approved elementary treatises is the *Tarka-bhāṣā* of Keśava-miśra, author of many other tracts. Though adapted to the comprehension of the learner without the aid of a gloss, it has nevertheless employed the labour of many commentators, expounding and illustrating it. Among others may be named, in order of seniority, Govardhana-miśra in the *Tarka-bhāṣā-prakāśa*; Gaurīkānta[11] (author likewise of the *Sadyukti-muktāvalī*) in the *Bhārārtha-dīpikā*; Mādhavadeva (author of the *Nyāyasāra*) in the *Tarka-bhāṣā-sāra-mañjarī*; besides Rāmalinga-kṛti in the *Nyāya-sangraha*, whose relative antiquity is less certain; and Balibhadra,[12] who is known to me only from Gaurīkānta's citations.

Another compendious introduction to the study of Indian logic is the *Padārtha-dīpikā*[13] by Konḍa-bhaṭṭa, a noted grammarian, author of the *Vaiyākaraṇa-bhuṣaṇa*, on the philosophy of grammatical structure. It does not appear to have had any commentator, and it needs none.

Metrical treatises, or memorial verses, comprising the elements of the science, bear the ordinary denomination of *Kārikā*. A work of this description is the *Kusumāñjali*,[14] with its commentary, by Nārayaṇa-tīrtha; another, which likewise is expounded by its author, is the *Nyāya-saṅkṣepa* of Govinda-bhaṭṭāchārya.

Elementary works only have been here spoken of.[15] Distinct treatises on diverse branches of the whole subject, and on various emergent topics, are innumerable. No department of science or literature has more engaged the attention of the Hindus than the Nyāya;[16] and the fruit of their lucubrations has been an infinity of volumes, among which are compositions of very celebrated schoolmen.[17]

The order observed, both by Gotama and by Kaṇāda, in delivering the precepts of the science which they engage to unfold, is that which has been intimated in a passage of the *Vedas* cited in the *Bhāṣya*, as requisite steps of instruction and study: *viz.* Enunciation, definition, and investigation.[18] Enunciation (*uddeśa*) is the mention of a thing by its name; that is, by a term signifying it, as taught by revelation: for language is considered to have been revealed to man. Definition (*lakṣaṇa*) sets forth a peculiar property, constituting the essential character of a thing. Investigation (*parīkṣā*) consists in disquisition upon the pertinence and sufficiency of the definition. Consonantly to this, the teachers of philosophy promise the terms of the science, proceed to the definitions, and then pass on to the examination of subjects so premised.

In a logical arrangement the "predicaments" (*padārtha*), or "objects of proof", are six, as they are enumerated by Kaṇāda;[19] *viz.* Substance, quality, action, community, particularity, and aggregation or intimate relation: to which a seventh is added by other authors; privation or negation.[20] Thus augmented, they compose a two-fold arrangement, positive and negative (*bhāva* and *abhāva*); the first comprising six, the latter one.[21]

The *Bauddhas*, or followers of Buddha, are said to identify the predicaments with knowledge (*jñāna*); and according to the *Vedāntis*, who are pantheists, the predicaments are identified with the universal being (*Brahma*) in whom all exists.[22]

Other categories are alleged by different authorities; as power or energy (*śakti*); similarity or resemblance (*sādṛśya*); and many more. But the logicians of this school acknowledge but six, or at most seven, above mentioned.

Gotama enumerates sixteen heads or topics: among which, proof or evidence, and that which is to be proven, are chief; and the rest are

subsidiary or accessory, as contributing to knowledge and ascertainment of truth. Disputation being contemplated in this arrangement, several among these heads relate to controversial discussion. They are, – 1st, proof; 2nd, that which is to be known and proven; 3rd, doubt; 4th, motive; 5th, instance; 6th, demonstrated truth; 7th, member of a regular argument of syllogism; 8th, reasoning by reduction to absurdity; 9th, determination or ascertainment; 10th, thesis or disquisition; 11th, controversy; 12th, objection; 13th, fallacious reason; 14th, perversion; 15th, futility; 16th, confutation.[23]

The difference between these two arrangements is not considered to amount to discrepancy. They are held to be reconcilable: the one more ample, the other more succinct; but both leading to like results.

The *Sāṃkhya* philosophy, as shown in a former essay,[24] affirms two eternal principles, soul and matter; (for *prakṛti* or nature, abstracted from modifications, is no other than matter): and reckoning, with these two permanent principles, such as are transient, they enumerate twenty-five.

The *Nyāya* as well as the *Sāṃkhya*, concur with other schools of psychology in promising beatitude, or (*niḥśreyas*) final excellence; and (*mokṣa*) deliverance from evil, for the reward of a thorough knowledge of the principles which they teach; that is, of truth; meaning the conviction of the soul's eternal existence separable from body.

Soul then, as the *Bhāṣya* affirms, is that which is to be known and proven. Gotama, however, enumerates under this head, besides soul, its associate body, the external senses things or the objects of sense (that is, the elements; and his followers here take occasion to introduce Kaṇāda's six categories), intellect or understanding, mind or the internal organ, activity, fault, transmigration, fruit or consequence of deeds, pain or physical evil, and lastly, liberation; making, together with soul, twelve (*prameya*) objects of proof, being topics of knowledge requisite for deliverance.

I. Evidence or proof (*pramāṇa*) by which those objects are known and demonstrated, is of four kinds: perception; inference of three sorts (consequent, antecedent, and analogous); comparison; and affirmation (comprehending tradition, as well as revelation). Inference *à priori* concludes an effect from its cause; inference *à posteriori* deduces a cause from its effect: another ground of inference is analogy. Or one sort is direct and affirmative; another indirect or negative; and the third is both direct and indirect.[25]

Proof (*pramāṇa*) is defined to be the efficient or especial cause of actual knowledge: and this intends right notion (*anubhava*); exclusive,

consequently, of wrong notion, as error, doubt, and reduction to absurdity, and likewise exclusive of memory: for notion (*anubhava*) is knowledge other than remembrance.

Cause (*kāraṇa*) is that which is efficacious, necessarily preceding an effect that cannot else be: and conversely, effect (*kārya*) is that which necessarily ensues and could not else be.

For the relation of cause and effect, and for distinguishing different sorts of cause, connexion (*saṃbandha*) or relation, in general, must be considered. It is two-fold: simple conjunction (*saṃyoga*), and aggregation or intimate and constant relation (*samavāya*); the latter being the connexion of things, whereof one, so long as they coexist, continues united with the other: for example, parts and that which is composed of them, as yarn and cloth; for so long as the yarn subsists the cloth remains. Here the connexion of the yarn and cloth is intimate relation; but that of the loom is simple conjunction. Consonantly to this distinction, cause is intimate or direct, producing aggregation or an intimately relative effect, as clay of pottery or yarn of cloth: or it is mediate or indirect, being proximate to the aggregating cause, as conjunction of yarn, serving for the production of cloth: or thirdly, it is neither direct nor indirect; but instrumental or concomitant, as the loom Of positive things there must be three causes, and the most efficacious is termed the chief or especial cause:[26] of negative there is but one, which is the third above mentioned.

This would be the place for an ample discussion of the several sorts of proof above mentioned. But they are topics embracing too great a scope of disquisition in the Hindu philosophy, to be adequately considered within the limits of the present essay. The subject, therefore, is reserved for future consideration, in a connected view of it, with relation to the various Indian systems of philosophizing, after they shall have been severally examined.[27]

II. 1. The first and most important of twelve objects of evidence or matters to be proven, enumerated by Gotama, is soul.[28] It is the site of knowledge or sentiment: distinct from body and from the senses; different for each individual co-existent person; infinite; eternal; perceived by the mental organ; and demonstrated by its peculiar attributes, intellect, etc. For knowledge, desire, aversion volition, pain and pleasure, severally and collectively, argue the existence of soul: since these are not universal attributes, as number, quantity, etc., common to all substances; but are peculiar and characteristic qualities, apprehended exclusively by one organ as colour and other peculiar qualities are; yet belonging not to apparent substances, as

earth, and the rest; and arguing therefore a distinct substratum, other than space, time and mind to which universal, not peculiar, qualities appertain. That distinct substance, which is the substratum of those peculiar qualities, is the soul.

This concerns the living soul (*jivātmā*), the animating spirit of individual person. Souls then, as is expressly affirmed, are numerous. But the supreme soul (*Paramātmā*) is one: the seat of eternal knowledge; demonstrated as the maker of all things.[29]

The individual soul is infinite; for whithersoever the body goes there the soul too is present. It experiences the fruit of its deeds; pain or pleasure. It is eternal, because it is infinite; for whatever is infinite is likewise eternal; as the etherial element (*ākāśa*).

Being a substance, though immaterial, as a substratum of qualities, it is placed in Kaṇāda's arrangement as one of nine substances which are there recognized.[30]

It has fourteen qualities: *viz.* Number, quantity, severalty, conjunction, disjunction, intellect, pleasure, pain, desire, aversion, volition, merit, demerit, and faculty of imagination.

2. The second among matters to be proven in Gotama's enumeration, is body. It is the site of effort, of organs of sensation, and of sentiment of pain or pleasure.[31]

It is an ultimate compound; the seat of soul's enjoyment. It is a whole, composed of parts; a framed substance, not inchoative: associated with which, soul experiences fruition;[32] that is, immediate presence of pain or of pleasure, in relation to itself.

It is the site of effort; not of motion simply, but of action tending to the attainment of what is pleasing, and to the removal of what is displeasing.[33]

It is earthly; for the qualities of earth are perceived in it: (namely, smell, colour, solidity, etc.): and it is expressly pronounced so by more than one passage of the *Vedas*. According to some opinions, it consists of three elements, earth, water, and light or heat; for the peculiar qualities of those elements are perceptible in it, since it has smell, clamminess, and warmth: or it consists of four, since there is inspiration as well as expiration of air: or of five, as indicated by odour, moisture, digestion, breath, and cavities.[34] Those opinions are controverted by the *Nyāya*. It consists not of five, nor of four elements: else, as Kaṇāda argues, it would be invisible; for the union of visible with invisible objects is so: instance wind. Nor does it consist of three visible elements, nor of two; for there is no intimate inchoative union of heterogeneous substances.[35] This last reason is

alleged likewise by Kapila: heterogeneous materials cannot enter into the same composition.[36]

Besides human and other bodies of this world, all which are terrene, there are, in other worlds, aqueous, igneous, and aerial bodies. In these, too, there is union with an element, for soul's fruition.[37]

Earthly body is two-fold; sexually bred, or not so bred: the first is either viviparous or oviparous: the second results from concurrence of particles by an unseen or predestined cause, and peculiar disposition of atoms. That such beings are, is proved from authority of the *Vedas*, which reveal creation of gods and demi-gods.

Or the distinction is between such as are propagated by sexes or are otherwise generated. The latter comprehends equivocal generation of worms, nits, maggots, gnats and other vermin, considered to be bred in sweat or fermented filth; and germination of plants sprouting from the ground. Accordingly, the distinct sorts of body are five: 1st, ungenerated; 2nd, uterine or viviparous; 3rd, oviparous; 4th, engendered in filth; 5th, vegetative or germinating.[38]

3. Next, among objects of proof, are the organs of sensation. An organ of sense is defined as an instrument of knowledge, conjoined to the body and imperceptible to the senses.[39]

There are five external organs: smell, taste, sight, touch, and hearing. They are not modifications of consciousness (as the *Sāṃkhyas* maintain), but material, constituted of the elements, earth, water, light, air, and ether, respectively.[40]

The pupil of the eye is not the organ of sight (as the *Bauddhas* affirm); nor is the outer ear, or opening of the auditory passage, the organ of hearing: but a ray of light, proceeding from the pupil of the eye towards the object viewed is the visual organ; and ether, contained in the cavity of the ear, and communicating by intermediate ether with the object heard, is the organ of hearing. That ray of light is not ordinarily visible: just as the effulgence of a torch is unseen in meridian sunshine. But, under particular circumstances, a glimpse of the visual ray is obtained. For instance, in the dark, the eye of a cat or other animal prowling at night.

The organ of vision then is lucid; and, in like manner, the organ of hearing is etherial; and that of taste, aqueous (as saliva); and of feeling, aerial; and of smelling, earthly.

The site of the visual organ is the pupil of the eye; of the auditory organ, the orifice of the ear; of the olfactory organ, the nostril or tip of the nose; of the taste, the tip of the tongue; of the feeling, the skin.

Objects apprehended by the senses, are odour, flavour, colour, touch (or temperature), and sound; which are qualities appertaining to earth, water, light, air, and ether.[41]

The existence of organs of sense is proved by inference, from the fact of the apprehension of those objects: for apprehension implies an instrument to effect it, since it is an act, in like manner as the act of cutting implies an instrument, as an axe or a knife.

The organs are six, including an internal organ, termed *manas*, or mind: not five only, as the followers of Buddha maintain, disallowing an internal sense; nor so many as eleven, which the *Sāṃkhyas* affirm, comprehending with the senses the organs of action, which they reckon five.[42]

Mind is the instrument which effects the apprehension of pain, pleasure, or interior sensations; and, by its union with external senses, produces knowledge of exterior objects apprehended through them, as colour, etc., but not independently of those senses, for outward objects.

Its existence is proved by singleness of sensation: since various sensations do not arise at one time to the same soul. They only seem to do so when passing rapidly, though successively; as a firebrand, whirled with velocity, seems a ring of fire.

It is single; that is, for each soul, one: not so many minds as there are external senses. When it is conjoined with any one of the outward organs, knowledge is received through that organ: when not so conjoined, none comes through that sense, but through any other with which it then is associated.[43]

It is not infinite, being imperceptible to the touch, like the etherial element, as the *Mīmāṃsā* maintains;[44] but it is minutely small, as an atom. Were it infinite, it might be united with everything at once, and all sensations might be contemporaneous. It is imperceptible to sight, touch, and other senses, and is inferred from reasoning, as follows: There must be an instrument of apprehension of pain and pleasure, which instrument must be other than the sight, or any external sense; for pain and pleasure are experienced though sight be wanting. Such instrument of painful or pleasurable sensation is termed mind (*manas*).

It is eternal, and is distinct from soul as well as from body, with which it is merely conjoined.

It is reckoned by Kaṇāda among substances; and is the substratum of eight qualities, none of which are peculiar to it, being all common to other substances: *viz.* Number, quantity, individuality, conjunction, disjunction, priority, subsequence, and faculty.[45]

4. Next in Gotama's arrangement are the (*artha*) objects of sense; that is, of the external senses: and he enumerates odour, taste, colour, feel, and sound, which are the peculiar qualities of earth, and the rest of the elements respectively.[46]

Under this head Keśava places the categories (*padārtha*) of Kanāda, which are six; substance, quality, etc.

(I.) Substance is the intimate cause of an aggregate effect or product: it is the site of qualities and of action; or that in which qualities abide, and in which action takes place.[47]

Nine are enumerated, and no more are recognized. Darkness has been alleged by some philosophers; but it is no substance; nor is body a distinct one; nor gold, which the *Mīmāṃsakas* affirm to be a peculiar substance.

Those specified by Kaṇāda are:

(1.) Earth, which, besides qualities common to most substances (as number, quantity, individuality, conjunction, disjunction, priority, posteriority, gravity, fluidity, and faculty of velocity and of elasticity), has colour, savour, odour, and feel, or temperature. Its distinguishing quality is smell; and it is succinctly defined as a substance odorous.[48] In some instances, as in gems, the smell is latent; but it becomes manifest by calcination.

It is eternal, as atoms; or transient, as aggregates. In either, those characteristic qualities are transitory, and are maturative, as affected by light and heat: for by union with it, whether latent or manifest, former colour, taste, smell, and temperature are in earth of any sort annulled, and other colour, etc., introduced.

Aggregates or products are either organized bodies, or organs of perception, or unorganic masses.

Organized earthly bodies are of five sorts [see body]. The organ of smell is terreous. Unorganic masses are stones, lumps of clay, etc. The union of integrant parts is hard, soft, or cumulative, as stones, flowers, cotton, etc.

(2.) Water, which has the qualities of earth; excepting smell, and with the addition of viscidity. Odour, when observable in water, is adscititious, arising from mixture of earthy particles.

The distinguishing quality of water is coolness. It is accordingly defined as a substance cool to the feel.

It is eternal, as atoms; transient, as aggregates. The qualities of the first are constant likewise; those of the latter inconstant.

Organic aqueous bodies are beings abiding in the realm of Varuṇa. the organ of taste is aqueous: witness the saliva. Unorganic waters are rivers, seas, rain, snow, hail, etc.

It is by some maintained, that hail is pure water rendered solid by supervention of an unseen virtue[49]: others imagine its solidity to be owing to mixture of earthy particles.

(3.) Light is coloured, and illumines other substances; and to the feel is hot: which is its distinguishing quality. It is defined as a substance hot to the feel. [Heat, then, and light, are identified as one substance.]

It has the qualities of earth, except smell, taste, and gravity. It is eternal, as atoms; not so, as aggregates.

Organic luminous bodies are beings abiding in the solar realm. The visual ray, which is the organ of sight, is lucid [see organs of perception]. Unorganic light is reckoned four-fold: earthy, celestial, alvine, and mineral. Another distinction concerns sight and feel; as light or heat may be either latent or manifest, in respect of both sight and feel, or differently in regard to either. Thus fire is both seen and felt; the heat of hot water is felt, but not seen; moonshine is seen, but not felt; the visual ray is neither seen nor felt. Terrestrious light is that, of which the fuel is earthy, as fire. Celestial is that, of which the fuel is watery, as lightning, and meteors of various sorts. Alvine is that, of which the fuel is both earthy and watery: it is intestinal, which digests food and drink. Mineral is that which is found in pits, as gold. For some maintain that gold is solid light; or, at least that the chief ingredient is light, which is rendered solid by mixture with some particles of earth. Were it mere earth, it might be calcined by fire strongly urged. Its light is not latent, but overpowered by the colour of the earthy particles mixed with it. In the *Mīmāṃsā*, however, it is reckoned a distinct substance, as before observed.

(4.) Air is a colourless substance, sensible to feel; being temperate (neither hot, nor cold). Besides this its distinguishing quality, it has the same common qualities with light, except fluidity (that is number, quantity, individuality, conjunction, disjunction, priority, subsequence, and faculty of elasticity and velocity).

Its existence as a distinct substance is inferred from feeling. The wind, that blows, is apprehended as temperate, independently of the influence of light: and this temperature, which is a quality, implies a substratum; for it cannot subsist without one: that substratum is air; different from water, which is cold; and from light, which is hot; and from earth, which is adventitiously warm by induction of light.

Air is either eternal as atoms, or transient as aggregates. Organic aerial bodies are beings inhabiting the atmosphere, and evil spirits (*Piśācas*, etc.) who haunt the earth. The organ of touch is an aerial

integument, or air diffused over the cuticle. Unorganic air is wind, which agitates trees and other tremulous objects. To these may be added, as a fourth kind of aerial aggregates, the breath and other vital airs.

(5.) Ether (*ākāśa*), which is a substance that has the quality of sound. Besides that its peculiar and distinguishing quality, it has number (*viz.* Unity), quantity, individuality, conjunction, and disjunction. It is infinite, one, and eternal.

The existence of an etherial element as a distinct substance is deduced, not from distinct perception, but from inference. Sound is a peculiar quality; for, like colour and other peculiar qualities, it is apprehended by only one external organ of such beings as men are: now a quality abides in a substance which is qualified; but neither soul, nor any one of the four elements, earth, water, light, and air, can be its substratum, for it is apprehended by the organ of hearing: the qualities of earth, and the rest are not apprehended by the hearing, but sound is; therefore it is not a quality of those substances; nor is it a quality of time, space, and mind; since it is a peculiar quality, and those three substances have none but such as are common to many: therefore a substratum, other than all these, is inferred; and that substratum is the etherial element. It is one; for there is no evidence of diversity; and its unity is congruous, as infinity accounts for ubiquity. It is infinite, because it is in effect found everywhere. It is eternal, because it is infinite.

It appears white, from connexion with a lucid white orb; as a rock-crystal appears red by association with a red object. The blue colour of a clear sky is derived, according to Patañjali,[50] from the southern peak of the great mountain Sumeru, which is composed of sapphire. On other sides of Sumeru the colour of the sky is different, being borrowed from the hue of the peak which overlooks that quarter. Others suppose that the black colour of the pupil of the eye is imparted to the sky (blue and black being reckoned tinges of the same colour), as a jaundiced eye sees every object yellow.

The organ of hearing is etherial, being a portion of ether (*ākāśa*) confined in the hollow of the ear, and (as affirmed by the author of the *Padārtha-dīpikā*) endued with a particular and unseen virtue. In the ear of a deaf man, the portion of ether which is there present is devoid of that particular virtue, and therefore it is not a perfect and efficient auditory organ.

(6.) Time is inferred from the relation of priority and subsequence, other than that of place. It is deduced from the notions of quick, slow,

simultaneous, etc., and is marked by association of objects with the sun's revolutions.

Young is the reverse of old, as old is of young. This contrast, which does not concern place, is an effect, needing a cause other than place, etc. That cause is time.

It has the qualities of number, quantity, individuality, conjunction, and disjunction. It is one, eternal, infinite.

Though one, it takes numerous designations; as past, present, and future, with reference to acts that are so.

(7.) Place, or space, is inferred from the relation of priority and subsequence, other than that of time. It is deduced from the notions of *here* and *there*.

It has the same common qualities as time; and, like it, is one, eternal, infinite.

Though one, it receives various designations, as east, west, north, south, etc., by association with the sun's position.

(8.) Soul, though immaterial, is considered to be a substance, as a substratum of qualities. It is eighth in Kaṇāda's arrangement. In Gotama's it is first among things to be proven [see before].

(9.) Mind, according to Kaṇāda, is a ninth substance; and in Gotama's arrangement, it recurs in two places, as one of the twelve matters to be proven; and again, under the distinct head of organs of sensation, being reckoned an internal sense [see before].

Material substances are by Kaṇāda considered to be primarily atoms; and secondarily, aggregates. He maintains the eternity of atoms; and their existence and aggregation are explained as follows:[51]

The mote, which is seen in a sunbeam, is the smallest perceptible quantity. Being a substance and an effect, it must be composed of what is less than half itself: and this likewise is a substance and an effect; for the component part of a substance that has magnitude must be an effect. This again must be composed of what is smaller, and that smaller thing is an atom. It is simple and uncomposed; else the series would be endless: and, were it pursued indefinitely, there would be no difference of magnitude between a mustard-seed and a mountain, a gnat and an elephant, each alike containing an infinity of particles. The ultimate atom then is simple.

The first compound consists of two atoms: for one does not enter into composition; and there is no argument to prove, that more than two must, for inchoation, be united. The next consists of three double atoms; for, if only two were conjoined, magnitude would hardly ensue, since it must be produced either by size or number of particles;

it cannot be their size and therefore it must be their number. Nor is there any reason for assuming the union of four double atoms, since three suffice to originate magnitude.[52]

The atom then is reckoned to be the sixth part of a mote visible in a sunbeam.[53]

Two earthly atoms, concurring by an unseen peculiar virtue, the creative will of GOD, or time, or other competent cause, constitute a double atom of earth; and, by concourse of three binary atoms, a tertiary atom is produced; and, by concourse of four triple atoms, a quaternary atom; and so on, to a gross, grosser, or grossest mass of earth: thus great earth is produced; and in like manner, great water, from aqueous atoms; great light, from luminous; and great air, from aerial. The qualities that belong to the effect are those which appertained to the integrant part, or primary particle, as its material cause: and conversely, the qualities which belong to the cause are found in the effect.

The dissolution of substances proceeds inversely. In the integrant parts of an aggregate substance resulting from composition, as in the potsherds of an earthen jar, action is induced by pressure attended with velocity, or by simple pressure. Disjunction ensues; whereby the union, which was the cause of inchoation of members, is annulled; and the integral substance, consisting of those members, is resolved into its parts, and is destroyed; for it ceases to subsist as a whole.

(II.) Quality is closely united with substance; not, however, as an intimate cause of it, nor consisting in motion, but common; not a genus, yet appertaining to one. It is independent of conjunction and disjunction; not the cause of them, nor itself endued with qualities.[54]

Twenty-four are enumerated. Seventeen only are, indeed, specified in Kaṇāda's aphorisms;[55] but the rest are understood.

(1.) Colour. It is a peculiar quality to be apprehended only by sight; and abides in three substances; earth, water and light. It is a characteristic quality of the last; and, in that, is white and resplendent. In water, it is white, but without lustre. In the primary atoms of both it is perpetual; in their products, not so. In earth it is variable; and seven colours are distinguished: *viz.* White, yellow green, red, black, tawny (or orange),[56] and variegated. The varieties of these seven colours are many, unenumerated. The six simple colours occur in the atoms of earth; and the seven, including variegated, in its double atoms, and more complex forms. The colour of integrant parts is the cause of colour in the integral substance.

(2.) Savour. It is a peculiar quality, to be apprehended only by the organ of taste; and abides in two substances, earth and water. It is a characteristic quality of the last; and in it is sweet. It is perpetual in atoms of water; not so in aqueous products. In earth it is variable; and six sorts are distinguished: sweet, bitter, pungent, astringent, acid, and saline.

(3.) Odour. It is a peculiar quality, to be apprehended only by the organ of smell; and abides in earth alone, being its distinguishing quality. In water, odour is adscititious, being induced by union with earthy particles; as a clear crystal appears red by association with a hollyhock, or other flower of that hue. In air also it is adscititious: thus a breeze, which has blown over blossoms, musk, camphor, or other scented substances, wafts fragrant particles of the blossoms, etc. The flowers are not torn, nor the musk diminished; because the parts are replaced by a reproductive unseen virtue. However, camphor and other volatile substances do waste.

Two sorts of odour are distinguished, fragrance and stench.

(4.) Feel, and especially temperature. It is a peculiar quality, to be apprehended only by the skin or organ of feeling. It abides in four substances; earth, water, light, and air; and is a characteristic quality of the last.

Three sorts are distinguished, cold, hot, and temperate. In water, it is cold; in light, hot; in earth and in air, temperate. Divers other sorts, likewise are noticed; as hard and soft, and diversified, etc.

These four qualities are latent in minute substances, as atoms and double atoms; manifest to perception in products or aggregates of greater magnitude. A mote in a sunbeam may be seen, though not felt. The colour of the visual ray, or organ of sight, is ordinarily imperceptible.

(5.) Number. It is the reason of perceiving and reckoning one, two, or many, to the utmost limit of numeration The notion of number is deduced from comparison.[57] Of two masses seen, this is one, and that is one: hence the notion of two, and so of more.[58]

It is an universal quality, common to all substances without exception.

It is considered to be of two sorts, unity and multitude; or of three, monad, duad, and multitude. Unity is either eternal or transient: eternal unity regards eternal things; that which is uneternal, concerns effects or transitory substances.

(6.) Quantity. It is the special cause of the use and perception of measure

It is a universal quality, common to all substances

It is considered to be fourfold: great and small; long and short.

Extreme littleness and shortness are eternal; as mind, or as atoms, whether single or double, etc. Extreme length and greatness (termed infinite) are likewise eternal, as ether.

Within these extremes is inferior magnitude or finite quantity; which is uneternal. It is of various degrees in length and bulk, more or most; from the mote or tertiary atom, upwards to any magnitude short of infinite.

The finite magnitude of products or effects results from number, size, or mass. Multitude of atoms, bulk of particles, and heap of component parts, constitute magnitude. The latter, or cumulation of particles, concerns a loose texture. The others, close or compact.

Infinity transcends the senses. An object may be too great, as it may be too small, to be distinguished.

(7.) Individuality, severalty, or separateness, is a quality common to all substances.

It is of two sorts; individuality of one or of a pair; or it is manifold, as individuality of a triad, etc. Simple individuality is eternal, in respect of eternal things; transient, in regard to such as are transitory. Individuality of a pair or triad, etc., is of course transitory: it results from comparison, as duad or triad does.

(8.) Conjunction is a transient connexion.

It is a universal quality incident to all substances and is transitory.

It implies two subjects, and is threefold: arising from the act of either or of both, or else from conjunction; being simple, or reciprocal, or mediate. The junction of a falcon perching, which is active, with the perch whereon it settles, which is passive, in conjunction arising from the act of one. Collision of fighting rams, or of wrestlers, is conjunction arising from the act of both. Contact of a finger with a tree occasions the conjunction of the body with the tree; and this is mediate.

(9.) Disjunction. It is the converse of conjunction; necessarily preceded by it, and, like it, implying two subjects. It is not the mere negation of conjunction, nor simply the dissolution of it.

The knowledge of this quality, as well as of its counterpart, is derived from perception.

It is a universal quality incident to all substances and is simple, reciprocal, or mediate. A falcon taking flight from a rock, is an instance of disjunction arising from the act of one of two subjects; the active from the inactive. The parting of combatants, rams or

wrestlers, is an example of disjunction arising from the act of both. Disjunction of the body and the tree, resulting from the disunion of the finger and the tree, is mediate.[59]

(10–11.) Priority and posteriority. These qualities, being contrasted and correlative, are considered together. They are of two sorts, concerning place and time. In respect of place, they are proximity and distance; in regard to time, youth and antiquity. The one concerns (*mūrta*) definite bodies, consisting of circumscribed quantity; the other affects generated substances.

The knowledge of them is derived from comparison.

Two masses being situated in one place, nearness is deduced from the conjunction of one with place as associated by comparison, referring primarily to the person of the spectator; or, secondarily, to other correlatives of place. Where least conjunction of conjunct things intervenes, it is nearness; where most does, it is remoteness. Thus Prayāga is nearer to Mathurā than Kāśī, and Kāśī remoter from it than Prayāga.

In like manner, one of two masses, not restricted to place, is young, as deduced from the association of the object with time, by comparison discriminating that which is connected with least time. Another is old, which is connected with most time. Here time is determined by revolutions of the sun.

(12.) Gravity is the peculiar cause of primary descent or falling.[60]

It affects earth and water. Gold is affected by this quality, by reason of earth contained in it.

In the absence of a countervailing cause, as adhesion, velocity, or some act of volition, descent results from this quality. Thus a cocoa-nut is withheld from falling by adhesion of the foot-stalk; but, this impediment ceasing on maturity of fruit, it falls.

According to Udayana-ācārya, gravity is imperceptible, but to be inferred from the act of falling. Vallabha maintains, that it is perceived in the position of a thing descending to a lower situation.

Levity is not a distinct quality, but the negation of gravity

(13.) Fluidity is the cause of original trickling.[61]

It affects earth, light, and water. It is natural and essential in water; adscititious in earth and light; being induced by exhibition of fire in molten substances, as lac, gold, etc.

Fluidity is perceptible by the external senses, sight and touch.

In hail and ice, fluidity essentially subsists; but is obstructed by an impediment arising from an unseen virtue which renders the water solid.

(14.) Viscidity is the quality of clamminess and cause of agglutination. It abides in water only. In oil, liquid butter, etc., it results from the watery parts of those liquids.[62]

(15.) Sound is a peculiar quality of the etherial element, and is to be apprehended by the hearing. It abides in that element exclusively, and is its characteristic quality. Two sorts are distinguished: articulate and musical.[63]

To account for sound originating in one place being heard in another, it is observed, that sound is propagated by undulation, wave after wave, radiating in every direction, from a centre, like the blossoms of a Nauclea. It is not the first, nor the intermediate wave, that is the sound heard, but the last which comes in contact with the organ of hearing; and therefore it is not quite correct to say, that a drum has been heard. Sound originates in conjunction, in disjunction, or in sound itself. The conjunction of cymbals, or that of a drum and stick, may serve to exemplify the first. It is the instrumental cause. The rustling of leaves is an instance of disjunction being the cause of sound. In some cases, sound becomes the cause of sound. In all, the conformity of wind, or its calmness, is a concomitant cause: for an adverse wind obstructs it. The material cause is in every case the etherial fluid; and the conjunction of that with the sonorous subject is a concomitant cause.

The *Mīmāṃsā* affirms the eternity of sound. This is contested by the *Naiyāyikas*, who maintain, that were it eternal, it could not be apprehended by human organs of sense.

(16–23.) The eight following qualities are perceptible by the mental organ, not by the external senses. They are qualities of the soul, not of material substances.

(16.) Intelligence (*buddhi*) is placed by Kaṇāda among qualities; and by Gotama, fifth among objects of proof. It will be noticed in that place.

(17 and 18.) Pleasure and pain are among qualities enumerated by Kaṇāda. Pain or evil is placed by Gotama among objects of proof; where (under the head of deliverance) it will be further noticed, with its converse.

(19 and 20.) Desire and aversion are the two next in order among qualities. Desire is the wish of pleasure and of happiness, and of absence of pain. Passion is extreme desire; it is incident to man and inferior beings. The supreme being is devoid of passion. Neither does desire intend GOD's will, nor a saint's wish. Aversion is loathing or hatred.

(21.) Volition (*yatna*),[64] effort or exertion, is a determination to action productive of gratification. Desire is its occasion, and perception its reason. Two sorts of perceptible effort are distinguished: that proceeding from desire, seeking what is agreeable; and that which proceeds from aversion, shunning what is loathsome. Another species, which escapes sensation or perception, but is inferred from analogy of spontaneous acts, comprises animal functions, having for a cause the vital unseen power.

Volition, desire, and intelligence, are in man transitory, variable, or inconstant. The will and intelligence of GOD are eternal, uniform, constant.

(22 and 23.) Virtue and vice (*Dharma* and *Adharma*), or moral merit and demerit, are the peculiar causes of pleasure and of pain respectively. The result of performing that which is enjoined, as sacrifice, etc., is virtue; the result of doing that which is forbidden, is vice. They are qualities of the soul; imperceptible, but inferred from reasoning.

The proof of them is deduced from transmigration. The body of an individual, with his limbs and organs of sense, is a result of a peculiar quality of his soul; since this is the cause of that individual's fruition, like a thing which is produced by his effort or volition. The peculiar quality of the soul, which does occasion its being invested with body, limbs, and organs, is virtue or vice: for body and the rest are not the result of effort and volition.[65]

(24.) The twenty-fourth and last quality is faculty (*saṃskāra*).[66] This comprehends three sorts.

Velocity (*vega*), which is the cause of action. It concerns matter only; and is a quality of the mental organ, and of the four grosser elements, earth, water, light, and air. It becomes manifest from the perception of motion.

Elasticity (*sthitisthāvaka*) is a quality of particular tangible, terrene objects; and is the cause of that peculiar action, whereby an altered thing is restored to its pristine state, as a bow unbends and a strained branch resumes its former position. It is imperceptible; but is inferred from the fact of the restitution of a thing to its former condition.

Imagination (*bhāvanā*) is a peculiar quality of the soul, and is the cause of memory. It is a result of notion or recollection; and being excited, produces remembrance; and the exciting cause is the recurrence of an association; that is, of the sight or other perception of a like object.

(III.) The next head in Kaṇāda's arrangement, after quality, is action (*karman*).[67]

Action consists in motion, and, like quality, abides in substance alone. It affects a single, that is a finite substance, which is matter. It is the cause (not aggregative, but indirect) of disjunction, as of conjunction: that is, a fresh conjunction in one place, after annulment of a prior one in another, by means of disjunction. It is devoid of quality, and is transitory.

Five sorts are enumerated: to cast upward; to cast downward; to push forward: to spread horizontally; and, fifthly, to go on: including many varieties under the last comprehensive head.

(IV.) Community (*sāmānya*), or the condition of equal or like things, is the cause of the perception of conformity. It is eternal, single, concerning more than one thing, being a property common to several. It abides in substance, in quality, and in action.

Two degrees of it are distinguished: the highest, concerning numerous objects; the lowest, concerning few. The first is existence, a common property of all. The latter is the abstraction of an individual, varying with age, in dimensions, yet continuing identical. A third, or intermediate degree, is distinguished, comprehended in the first, and including the latter. These three degrees of community correspond nearly with genus, species, and individual.

In another view, community is two-fold: *viz.* Genus (*jāti*) and discriminative property (*upādhi*), or species.

The *Bauddhas* are cited as denying this category, and maintaining that individuals only have existence, and that abstraction is false and deceptive. This, as well as other controverted points, will be further noticed at a future opportunity.

(V.) Difference (*viśeṣa*), or particularity, is the cause of perception of exclusion.[68] It affects a particular and single object, which is devoid of community. It abides in eternal substances. Such substances are mind, soul, time, place; and the etherial element; and the atoms of earth, water, light, and air.[69]

(VI.) The sixth and last of Kaṇāda's categories is aggregation (*samavāya*), or perpetual intimate relation. It has been already briefly noticed.

(VII.) To the six affirmative categories of Kaṇāda, succeeding writers add a seventh, which is negative.

Negation or privation (*abhāva*) is of two sorts; universal and mutual. Universal negation comprehends three species, antecedent, emergent, and absolute.

Antecedent privation (*prāgabhāva*) is present negation of that which at a future time will be. It is negation in the material cause previous to the production of an effect; as, in yarn, prior to the fabrication of cloth, there is antecedent privation of the piece of cloth which is to be woven. It is without beginning, for it has not been produced; and has an end, for it will be terminated by the production of the effect.

Emergent privation is destruction (*dhvaṃsa*), or cessation, of an effect. It is negation in the cause, subsequent to the production of the effect: as, in a broken jar, (smashed by the blow of a mallet) the negation of jar in the heap of potsherds. It has a commencement, but no end; for the destruction of the effect cannot be undone.

Absolute negation (*atyantābhāva*) extends through all times, past, present, and future. It has neither beginning nor end. For example, fire in a lake, colour in air.[70]

Mutual privation (*anyonyābhāva*) is difference (*bheda*).[71] It is reciprocal negation of identity, essence, or respective peculiarity.

5. To return to Gotama's arrangement. The fifth place, next after objects of sense, is by him allotted to intelligence (*buddhi*), apprehension, knowledge, or conception; defined as that which manifests, or makes known, a matter.

It is twofold; notion and remembrance. Notion (*anubhava*) includes two sorts; right and wrong. Right notion (*pramā*) is such as is incontrovertible. It is derived from proof, and is consequently fourfold; *viz.* From perception, or inference, or comparison, or revelation: for example: 1st, a jar perceived by undisordered organs; 2nd, fire inferred from smoke; 3rd a gayal[72] recognized from its resemblance to a cow; 4th, celestial happiness attainable through sacrifice, as inculcated by the *Vedas*.

Wrong notion deviates from truth, and is not derived from proof. It is threefold: doubt; premises liable to reduction to absurdity; and error (for example, mistaking mother-o'-pearl for silver).

Remembrance (*smaraṇa*), likewise, is either right or wrong. Both occur, and right remembrance especially, while awake. But, in sleep, remembrance is wrong.

6. The sixth place among objects of proof is allotted to mind. It has been already twice noticed; *viz.* Among organs of sense, and again among substances.

7. Activity (*pravṛtti*) is next in order. It is determination, the result of passion,[73] and the cause of virtue and vice, or merit and demerit; according as the act is one enjoined or forbidden. It is oral, mental, or

corporeal; not comprehending unconscious vital functions. It is the reason of all worldly proceedings.

8. From acts proceed faults[74] (*doṣa*): including under this designation, passion or extreme desire; aversion or loathing; and error or delusion (*moha*). The two first of these are reckoned by Kaṇāda among qualities.

9. Next in Gotama's arrangement is (*pretya-bhāva*) the condition of the soul after death; which is transmigration: for the soul, being immortal, passes from a former body which perishes, to a new one which receives it. This is a reproduction (*punar-utpatti*).[75]

10. Retribution (*phala*) is the fruit accruing from faults which result from activity. It is a return of fruition (*punar-bhoga*), or experience of pleasure or pain, in association with body, mind, and senses.

11. Pain, or anguish, is the eleventh topic of matters to be proven.

12. Deliverance from pain is beatitude: it is absolute prevention of every sort of ill: reckoned, in this system of philosophy, to comprehend twenty-one varieties of evil, primary or secondary:[76] *viz.* 1. Body; 2–7, the six organs of sense; 8–13, six objects (*viṣaya*) of sensation; 14–19, six sorts of apprehension and intelligence (*buddhi*); 20, pain or anguish; 21, pleasure. For even this, being tainted with evil, is pain; as honey drugged with poison is reckoned among deleterious substances.

This liberation from ill is attained by soul acquainted with the truth (*tattva*), by means of holy science; divested of passion through knowledge of the evil incident to objects; meditating on itself; and, by the maturity of self-knowledge, making its own essence present; relieved from impediments; not earning fresh merit or demerit, by deeds done with desire; discerning the previous burden of merit or demerit, by devout contemplation; and acquitting it through compressed endurance of its fruit; and thus (previous acts being annulled, and present body departed, and no future body accruing), there is no further connexion with the various sorts of ill, since there is no cause for them.[77] This, then, is prevention of pain of every sort; it is deliverance and beatitude.

III. After proof and matter to be proven, Gotama proceeds to other categories, and assigns the next place to doubt (*saṃśaya*).

It is the consideration of divers contrary matters in regard to one and the same thing; and is of three sorts, arising from common or from peculiar qualities, or merely from contradiction; discriminative marks being in all three cases unnoticed. Thus an object is observed, concerning which is becomes a question whether it be a man or a post:

the limbs which would betoken the man, or the crooked trunk which would distinguish the post, being equally unperceived. Again, odour is a peculiar quality of earth: it belongs not to eternal substances, as the etherial element; nor to transient elements, as water: is then earth eternal or uneternal? So, one affirms that sound is eternal; another denies that position; and a third person doubts.

IV. Motive (*prayojana*) is that by which a person is actuated, or moved to action. It is the desire of attaining pleasure, or of shunning pain; or the wish of exemption from both; for such is the purpose or impulse of every one in a natural state of mind.[78]

V. Instance (*dṛṣṭānta*) is, in a controversy, a topic on which both disputants consent. It is either concordant or discordant; direct or inverse: as the culinary hearth, for a direct instance of the argument of the presence of fire betokened by smoke; and a lake, for an inverse or contrary instance of the argument, where the indicating vapour is mist or fog.[79]

VI. Demonstrated truth (*siddhānta*) is of four sorts; *viz.* Universally acknowledged; partially so; hypothetically; argumentatively (or, *e concessu*).[80]

Thus, existence of substance, or of that to which properties appertain, is universally recognized, though the abstract notion of it may not be so; for the *Bauddhas* deny abstraction. Mind is by the *Naiyāyikas* considered to be an organ of perception, and so it is by the kindred sect of *Vaiśeṣikas.* The eternity of sound is admitted in the *Mimāṃsā*, and denied in the *Nyāya.* Supposing the creation of the earth to be proved, omniscience of the creator follows. In Jaimini's disquisition on the eternity, or the transitoriness, of sound, it is said, granting sound to be a quality.[81]

On the appositeness of some of these examples, in the cases to which they are her applied, as instances of diverse sorts of demonstration, there is a disagreement among commentators, which it is needless to go into.

VII. A regular argument, or complete syllogism (*nyāya*), consists of five members (*avayava*) or component parts.[82] 1st, the proposition (*pratijñā*);[83] 2nd, the reason (*hetu* or *apadeśa*); 3rd, the instance (*udāharaṇa or nidarśana*); 4th, the application (*upanaya*); 5th, the conclusion (*nigamana*).[84] Ex.

1. This hill is fiery:
2. For it smokes.
3. What smokes is fiery: as a culinary hearth

4. Accordingly,[85] the hill is smoking:
5. Therefore it is fiery.

Some* confine the syllogism (*nyāya*) to three members; either the three first, or the three last. In this latter form it is quite regular. The recital joined with the instance is the major; the application is the minor; the conclusion follows.[86]

VIII. Next in this arrangement is (*tarka*) reduction to absurdity. It is a mode of reasoning, for the investigation of truth, by deduction from wrong premises, to an inadmissible conclusion which is at variance with proof, whether actual perception or demonstrable inference. The conclusion to which the premises would lead is inadmissible, as contrary to what is demonstrated, or as conceding what is disproved.

It is not to be confounded with doubt, to which there are two sides; but to this there is but one.

Five sorts are distinguished by the more ancient writers, to which the moderns have added six, or even seven more varieties. It is needless to enumerate them: one or two examples may suffice.

Ex. 1 Is this hill fiery, or not? On this question one delivers his opinion that it is not fiery. The answer to him is, Were it not fiery, it would not smoke.

Ex. 2. If there be a jar in this place, it must look like the ground.

Fallacy of the same form, termed *tarkābhāsa*, comprises the like number of sorts and varieties.

The designations by which they are distinguished are familiar to the Indian scholastic disputation. It would be tedious to enumerate and explain them.

IX. Ascertainment (*nirṇaya*), or determination of truth, is the fruit of proof, the result of evidence and of reasoning, confuting objections and establishing the position in question.

X.–XII. Disputation (*kathā*) is conference or dialogue of interlocutors maintaining adverse positions, whether contending for victory, or seeking the truth. It comprises three of the categories.

X. One is (*jalpa*) debate of disputants contending for victory; each seeking to establish his own position and overthrow the opponent's.[87]

XI. Another is (*vāda*) discourse, or interlocution of persons communing on a topic in pursuit of truth, as preceptor and pupil together with fellow-students.

*The followers of the *Mimāṃsā. Pad. Dīp.*

XII. The third is (*vitaṇḍā*) cavil, or controversy wherein the disputant seeks to confute his opponent without offering to support a position of his own.

XIII. Next in Gotama's enumeration is fallacy, or, as it is termed, semblance of a reason (*hetvābhāsa*); it is the *non causa pro causa* of logicians. Five sorts are distinguished, embracing diverse varieties or subdivisions. They need not be here set forth.

XIV. Fraud (*chhala*), or perversion and misconstruction, is of three sorts: 1st, verbal misconstruing of what is ambiguous; 2nd, perverting, in a literal sense, what is said in a metaphorical one; 3rd, generalizing what is particular.

XV. After all these is (*jāti*) a futile answer, or self-confuting reply. No less than twenty-four sorts are enumerated.

XVI. The sixteenth, and last of Gotama's categories, is (*nigraha-sthāna*) failure in argument, or (*parājaya-hetu*) reason of defeat. It is the termination of a controversy. Of this, likewise, no fewer than twenty-two distinctions are specified; which are here passed by, as the present essay has already been extended to too great a length.[88]

NOTES

1 Read at a public meeting of the Royal Asiatic Society, Feb. 21, 1824. [The footnotes were added to the later, published, version.]
2 Gotama (or, as the name is often written, Gautama) is sometimes called the son of Utathya (Manu, iii. 16), but in *Mahābh.* I 4191 he is said to have been the son of Dīrghatamas and the grandson of Utathya. He is also called Akṣapāda, or Akṣacharaṇa; hence Madhava speaks of his system as the Akṣapāda-darśana (*Sarva-darś.-sang.* xi), and his followers are called Ākṣapādāḥ.
3 Another name for Kaṇāda is Kāśyapa (see Śaṃkara-miśra's *Upaskāra*, pp. 160. 161; cf. Also St. Petersb. Dict. *sub v.*). He is also called Kaṇabhakṣa or Kaṇabhuj, see *infra*, p. [329]; in the *Sarva-darśana-saṃgraha* his system is spoken of as the Aulūkyadarśana, and his followers are called Aulūkyāḥ in Hemachandra's *Abhidhānacintāmaṇi*.
4 *Nyāya* is derived from *ni+i*, "that by which we enter into a thing and draw conclusions," cf. *Siddh. Kaum.* ii. 457.
5 Or rather from the peculiar category *viśeṣa*
6 Thus the *Bhāṣā-parichheda*, the great modern text-book of logic in India, is founded on both systems, though the Vaiśeṣika preponderates. Vātsyāyana, in his ancient *Nyāya-bhāṣya*, i. 9, after discussing the twelve "matters to be proven" in the Nyāya, adds: "There is also another set of matters to be proven, substance, quality, action, community, difference, and intimate relation; and the former division is not to be considered as

exhaustive by itself. From the right knowledge of this arises supreme bliss, and from the false knowledge thereof arises mundane existence, – thus has it been declared by the Vaiśeṣika school " The Comm On the *Bhāṣā-parichh*, remarks that "these categories are received among the Vaiśeṣikāḥ, and not opposed to those of the followers of the Nyāya " It is not always easy to discriminate accurately between the exact tenets of the Nyāya and the Vaiśeṣika, especially in the later schools.

7 The Nyāya Sūtras were printed at Calcutta in 1828 with Viśvanatha-bhaṭṭāchārya's Commentary, and a translation of the first four books by Ballantyne, with extracts from the Comm , was published at Benares in 1850

8 The Vaiśeṣika Sūtras were edited in the Bibl. Ind. (Calcutta, 1861) with Śankara-miśra's Comm. and a gloss by the editor, Paṇḍit Jayanārāynṇa-tarka-panchānana Prof. Max Müller wrote a paper on the system in the Zeitschrift d Morgenl. Gesell. Vi. pp 1–34 (cf Also his appendix on 'Indian Logic' in Archbishop Thomson's 'Laws of Thought,' 1853); and Röer gave a German translation of the Sūtras with extracts from the Comm *Ibid* xxi. pp. 309–420, xxii. pp. 383–442 Mr. Gough has published an English translation with similar extracts in 'The Paṇḍit,' Benares, 1869–72

9 We are now enabled to fill up this blank. The original commentary on the Nyāya Sūtras, the *Nyāya-bhāṣya*, was written by Pakṣila-svāmin, also called Vātsyāyana; this was edited in the Bibl. Ind. By Paṇḍit Jayanārūyaṇa-tarka-pañcānana (Calcutta, 1865). We have next the *Nyāya-vārttika*, a Commentary on the *Bhāṣya*, which was written by Uddyotakara-āchārya, to clear away the erroneous interpretations of Diṅnāga and others (cf. Weber, Zeitschr d. D M. G. xxii. 727). I have never seen more than the first three *sūtras*, entitled *Nyāya-trisūtrī-vārttika*, but it is quoted on ii. 33 by Viśvanātha. Uddyotakara is mentioned in Subandhu's *Vāsavadattā* (p. 235, Calc. ed.), which Dr. Hall has proved, in the preface to his edition of that work, to be fully 1200 years old. Vācaspati-miśra wrote a commentary on the *Vārttika* in his *Nyāya-vārttika-tātparya-ṭīkā*, and this in its turn has been commented upon by Udayana-āchārya in his *Nyāya-vārttika-tātparya-pariśuddhi*. I have endeavoured to prove, in the preface to my translation of the *Kusumāñjali*, that Vācaspati-miśra probably lived in the tenth, and Udayana in the twelfth, century The Vaiśeṣika Sūtras were annotated by Praśastapāda in the *Praśastapāda-bhāṣya* or *Dravya-bhāṣya*, first mentioned by Dr. Hall in his Bibliographical Index (Śankara-miśra cites him as Prāśastadevāchārya); and the same writer (p. 65) mentions three glosses on this work, two anonymous, and one, the *Kiraṇāvali*, by Udayana-āchārya, of which only two books were completed by the author The *Kiraṇāvali* in its turn has been commented upon by Vardhamāna-upādhyāya in his *Kiraṇāvalī-prakāśa*. Śankara-miśra also often mentions a *Vṛittikāra* (as p. 161, 411, etc.) as an ancient authority. But this Vaiśeṣika series has not obtained the same universal acceptance as the Naiyāyika. Śankara-miśra, the author of the printed commentary, is a very recent author, as he quotes Jagadīśa's *Anumāna-mayūkha*, pp 154, 392.

10 Mentioned in Dr. Hall's Bibl. Index "as an elementary treatise on the Vaiśeṣika philosophy by Vallabha-nyāyāchārya," and as containing 2700 *ślokas*.

11 Dr. Hall calls him Gaurīkānta-sārvabhauma-bhaṭṭāchārya (Bibl. Index, p. 23).

12 Dr. Hall (Bibl. Index, p. 23) considers this to be Balabhadra-miśra, the author of the *Tarka-bhāṣā-prakāśikā*. He was the father of Govardhana-miśra, and "the father and son, it appears, went over precisely the same ground."

13 This is a Vaiśeṣika work.

14 This work, with its Commentary by Haridāsa-bhaṭṭāchārya, was printed in Calcutta in 1847 and 1859, and was also reprinted and translated by the present editor (Calcutta, 1864). It is not, however, a treatise on the elements of logic, but an attempt to prove the existence of a Supreme Being on the principles of the Nyāya. Dr. Hall (Bibl. Index, pp. 82–84) mentions several other Commentaries and secondary glosses.

15 To these may be added the *Tarka-saṃgraha*, edited and translated by Ballantyne at Benares in 1848, and again in 1852; and the *Bhāṣā-parichheda*, with its Comm. The *Siddhānta-muktāvalī*, by Viśvanātha-panchānana, printed at Calcutta in 1827 and 1870, and also by Röer in 1850 with an English translation of the text and part of the Comm.; there is also a very useful Bengali commentary upon it by Kāśīnātha-tarkapañcānana, printed in Calcutta in 1821. Ballantyne commenced a translation in 1851, but only a small portion was published.

16 One of the most celebrated of the mediæval logicians was Gangeśa-upādhyāya of Mithilā, who wrote a large treatise called the *Cintāmaṇi*, in four sections, on perception, inference, comparison, and testimony. It is this work which furnished the text-book for the celebrated Nuddea school of Bengal, which has produced the following writers. The school was founded by Raghunātha-śiromaṇi, who, according to tradition, was a fellow-student, under Vāsudeva-sārvabhauma, with Raghunandana and the religious reformer Caitanya, whose birth is fixed A D 1489; he wrote a Commentary entitled *Dīdhiti*, on the first two sections. Mathurānātha-tarkavāgīśa wrote a gloss on the *Dīdhiti*, and also an original Comm. On part of Gangeśa's work. Jagadīśa-tarkālankāra wrote a Comm On the *Dīdhiti* as well as many other works, especially the *Śabda-śakti-prakāśikā*. Gadādhara-bhaṭṭāchārya also wrote a Comm. On the *Dīdhiti*, as well as a series of works on the abstrusest points of the modern logic. A good specimen of the subtilties introduced by this school is found in the discussion on *vyāpti* in the *Siddhānta-muktāvali*, pp 61–67, where the author follows the doctrine of Raghu-nātha-śiromaṇi.

17 Cf. Hall's *Bibliographical Index*.

18 This passage is probably only an observation by the author of the *Nyāya-bhāṣya*, p. 9 (*trividhā cāsya śāstrasya pravṛttiḥ, uddeśo lakṣaṇam parīkṣā ceti*); it is alluded to in Viśvanātha's *Vṛtti*, p. 4, 1. 9, Śankara-miśra's *Upaskira*, p 3, 1. 3, and Mādhava's *Sarva-darśana-saṃg.* p. 104, 1. 21 (cf. Also Madhusūdana in *Ind. Stud.* I. p 18, 1. 26).

19 *K* 1 3

20 *Tark. Bhāṣ.* 1.
21 *Pad. Dīp.* 1.
22 *Tark. Bhāṣ* And N. *Saṃg.* 2. 4.
23 G. 1. The 11th and 12th in the above list might be better rendered 'wrangling' (*jalpa*), and 'cavilling' (*vitaṇḍā*); and the 16th is rather 'unfitness to be argued with' (*nigraha-sthāna*).
24 Ante, p 254, etc.
25 *Purvavat, śeṣarat, sāmānyato dṛṣṭam*, cf. *Sāṃkhya-kār.* 5; *Nyāya-sūt.* i. 5; *Sāṃkhya-sūt.* i. 103 (Comm.). The terms are the same in the two systems, but they are explained somewhat differently.
26 *i.e* the instrumental cause (*nimitta* or *karaṇa*). I may here add that the Hindus usually give 'the two halves' as the intimate cause of the pot, their 'conjunction' as the non-intimate or mediate, and 'the potter's stick' as the instrumental. So for 'desire' (*icchā*) the intimate cause is 'soul,' – the non-intimate is 'the conjunction of soul and its internal organ, mind,' – the instrumental is 'knowledge.'
27 *Vid.* p. 253.
28 G 1 1. 3. 2, and 3. 1. 1–5 *Tark. Bhāṣ.* 2. 1.
29 *Pad. Dīp.* 1, 8.
30 G. 1. [Kaṇ 1.5?]
31 G. 1. 1 3. 3
32 Each body is said to be formed, not merely by the natural causes, as parents, etc., but by the co-operation of the merit or demerit of the soul for whose experience it is produced. *Nyāya-sūt.* iii. 132.
33 *Tark. Bhāṣ.* And Comm.
34 G. 3. 1. 6. 1–5.
35 Kaṇ. 4 2. 1, and Com.
36 Kap. 3, 17–19 and 5, 102.
37 *Bhāṣya* on Got.
38 *Pad. Dīp.* and Mādh. On Keś.
39 *Tark. Bhāṣ.*
40 Got. 1. 1. 3. 4–5, and 3. 1. 7, and 8.
41 Got. 1. 1. 3. 6.
42 Gau On Keś.
43 Got. 1. 1. 3. 8. And 3. 2 6.
44 *Pad. Dīp.*
45 Gau on Keś
46 Got 1 1. 3. 5.
47 Kaṇ 1. 1. 4. 1. Keś and Com. *Pad. Dīp.*
48 Kaṇ 2. 1. 1. 1.
49 *Adrishta*, cf. *Kusumāñj.* i. 12
50 This reference to Patanjali is very curious; but no such name is given in Śankara-miśra's Comm. On *Vaiśeṣ.-sūtras*, ii. 1, 5, though he mentions the theory as held by some authors. If the name be not a mislection, it might throw some light on the Bātanjal or Bātankal quoted by Albīrūnī (cf. Sir H. Elliot's *Historians of India*, Vol. ii. p. 6, Prof. Dowson's note), which is described as "a collection of all the sciences, and one of the most valuable works of the sages of Hind." Albīrūnī constantly quotes it on questions of chronology and geography.

51 Kaṇ 2. 2. 2. 1. Keś. etc.
52 Keś.
53 *Pad. Dīp.*
54 Kaṇāda's definition of a quality (i. 1 16) is 'that which has substance as its substratum, is without qualities, is not a cause of conjunction or disjunction, as independent of them.'
55 Kaṇ 1. 1. 2. 2, and 1. 1. 4. 2.
56 One commentator (Mādhavadeva) specifies blue in place of orange; another (Gaurīkānta) omits both, reducing the colours to six.
57 *Apekṣābuddhi.*
58 Mādhava thus describes the origin of the idea of duality (*dvitva*) (*S. D. Saṃgr.* p. 107): "First there is the contact of the organ of sense with the object; then arises the knowledge of the genus unity; then the distinguishing perception, *apekṣābuddhi* (by which we apprehend 'this is one', 'this is one,' etc.); then the production of duality in the object; then the knowledge of the abstract genus of duality (*dvitvatva*); then the knowledge of the quality duality as it exists in the two things; then the conception, *saṃskāra* (*i.e.* the idea created by the soul's own energy out of the materials previously supplied to it by the senses and the internal organ mind) " (Cf. *Siddh.-muktāv.* p. 106.) All numbers, in fact, from duality upwards, are artificial, – *i.e.* they are made by our minds; unity alone exists in things themselves, – each being one, – and they only become two, etc., by our choosing to regard them so, and thus joining them in thought.
59 Mādhava quotes a proverbial *śloka*:
'Duality – the change produced (in the jar) by baking, – and disjunction produced by disjunction, –
Him whose mind vacillates not in regard to these three, they call a true *Vaiśeṣika.*'
For duality see supra. The other two subtile processes are described by him, pp. 108, 109; and in the *Siddh-muktāv.* pp. 102–104, 112, 113. The former relates to the internal changes of the atoms, while a black pot gradually becomes red by heat, – the other to indirect or mediate disjunction, mentioned in the text. The *Vaiśeṣikas* hold that when a pot is baked, the old black pot is destroyed, its several compounds of two or more atoms being destroyed; the action of the fire then produces the red colour in the separate atoms, and, joining these into new compounds, eventually produces a new red pot. The exceeding rapidity of the steps prevents the eye's detecting the change of the pots. (Might we not regard this as a vague anticipation of the molecular theory?) The followers of the *Nyāya* maintain that the fire penetrates into the different compounds of two or more atoms, and, without any destruction of the old pot, produces its effects on these compounds, and thereby changes not the pot, but its colour, etc. – it is still the same pot, only it is red, not black.
60 *Tark. Bhāṣ.* and *Pad. Dīp.*
61 *Tark. Bhāṣ.* and *Pad. Dīp.*
62 *Ibid.* and *Siddh. Saṃg.*
63 *Ibid.* and Gau., etc.

64 There is a useful technical verse, *Jñāna-janyā bhaved icchā, icchā-janyā bhavet kṛtiḥ, Kṛtiḥ-janyā bhavec-ceṣṭā, ceṣṭā-janyā bhavet kriyā.* *Kṛiti* here means *yatna* 'volition.' 'From knowledge arises desire (βούγησις), from desire volition (προαίρεσις), from volition conscious effort (ὕρεξις), and from this action.'

65 *Tark. Bhāṣ.*

66 Ballantyne, 'the self-reproductive faculty.'

67 'Action is that which abides in one substance, is without qualities, and is the direct cause of conjunctions and disjunctions.' – Kaṇ. i. 1. 17

68 'Particularity' is the individuality which characterizes eternal simple substances, – it is 'their ultimate and not further explicable difference.' 'All compound substances from jars, etc., down to the combination of two atoms, are mutually separated by the difference of their component parts, but "particularity" is the only mutual difference of atoms. This difference is differenced through itself only.' – *Siddh-Muktāv.* Cf. Śankara-miśra's Comm. On *Vaiś-sū.* I. 2. 6. He remarks in his Comm. On iii. 1. 9, that "progressive decrease in size must have a limit somewhere, – hence we infer a substratum in which this limit is found, *i.e.* the atom."

69 It is singular that, though the tenet of *viśeṣa* has given its name to Kaṇāda's school, there is very little said about it in the *Sūtras.* The word is only used in its technical meaning in i. 1. 4, 8; i. 2. 6; iv. 1. 4; vii. 1. II.

70 Another example would be the fact that there is no jar on the spot before me. There is on that spot an absolute non-existence of the jar, and even if a jar were moved there, the non-existence would not be destroyed but only transferred to the place where the jar was before. That which is absent is said to be the counter-entity or *pratiyogi* of the non-existence which is presumed, according to the ordinary rule, "*yasyābhāvaḥ sa eva pratiyogi, yathā ghaṭābhāvasya pratiyogi ghaṭaḥ.*"

71 This is said to exist between two notions which have no property in common. Thus 'a jar is not cloth,' – here the counter-proposition would be one of identity, 'a jar is cloth.'

72 *Bos gavœus* s. *frontalis.* As Res. vol viii. p. 487

73 Rather the result of any one of the three 'faults, (*Bhāṣya,* i. 18). Oral activity initiates the utterances of the voice, mental the perceptions of the mind, and corporeal the gestures of the body.

74 Or rather 'faults are characterized as causing activity,' *pravartanā-lakṣaṇā doṣāḥ* (Got. Sūt. i. 18). The wise man, according to Gotama, is he who avoids the three mistakes of having a liking for a thing, and acting accordingly; or of having a dislike for a thing, and acting accordingly; or of being stupidly in-different, and thereupon acting; instead of being intelligently indifferent, and not acting at all." (Ballantyne).

75 The *Bhāṣya* expressly adds that *punar* here implies continual repetition; *pretya-bhāva* is eternal a *parte ante* and only ceases at final liberation. Cf. iii. 22.

76 The primary or direct (*mukhya*) evil is 'pain,' but the others are secondary or indirect (*gauṇa*) evils, as being its causes.

77 Cf. *Rational Refutation,* sect. I. Ch. 2. pp. 25–34.

78 Got. 1. 1. 4. 1–3.

79 Got. 1. 1. 5. 1–6.

80 Got. 1. 1. 6. 1, etc. The fourth kind of *siddhānta, abhyupagama,* means rather 'implied dogma.' It is defined by Viśvanātha as 'the assuming of a particular fact by the leader of a school, in the course of some of his arguments, though he nowhere definitely lays it down in his *sūtras.*' Thus the author of the *Nyāya-sūtras* assumes that mind is an organ of sense (*indriya*) in his arguments in iii. 91–131, though he nowhere expressly asserts it. The explanation, however, given in the *Bhāṣya,* differs, as it often does, from that of the modern Nyāya.

81 Cf. Note, p. 330, where Colebrooke doubts where this is found. It appears to me, after comparing Śabara's Commentary on *Mīmāṃsā-sūt.* i. 1. 17, with that printed in Ballantyne's extract, that it must refer to one of the scholastic ways of explaining that argument of Jaimini's in favour of the eternity of sound against the Naiyāyikas. The latter held that sound could not be eternal, because it could be increased, as in the case of many voices. Jaimini (according to his Commentator) replies that, accepting the Naiyāyika doctrine that sound is a quality of the one all-pervading ether, it will then follow that it is without parts, and consequently sound cannot be increased, but only the *noise* which accompanies its manifestation.

82 The *Bhāṣya* mentions that some old teachers reckoned ten members.

83 The later Vaiśeṣikas call these five members *pratijñā, apadeśa, nidarśana, anusaṃdhāna, pratyāmnāya* (Śankara M. on VS. ix. 2, 2), but it is merely a difference of names.

84 In the Nyāya the middle term of an affirmative argument is called *hetu* 'the reason', *sādhana* 'the instrument of proof,' or *liṅga* 'the sign'; and the major term *sādhya,* or 'that which is to be established.' This last term is, however, sometimes used for the minor (cf. *Bhāṣya,* i. 36, *Vṛitti,* i. 37). The Vaiśeṣika uses (besides *hetu* and *liṅga*) *apadeśa, pramūṇa,* and *karaṇa* (ix. 2, 4). The later school of logic adopted *pakṣa* for the minor term (or sometimes *vivādapadam* or *vimatam*), and developed the notion of *vyāpti* 'prevadedness,' or 'the being invariably accompanied by some other thing.' (*Vyāpti* is called *pratibandha* in the *Sāṃkhya-sūt.* i. 100). Thus the major term of an affirmative argument became the *vyāpaka* or 'pervader' from its wider extension, the middle the *vyāpya* or 'pervaded.' The argument, 'the mountain has fire because it has smoke,' is true, because smoke is always accompanied by fire; 'the mountain has smoke because it has fire,' is false, because fire is not thus always accompanied by smoke. The latter is a favourite instance of the *anaikānta* or *savyabhichāra* fallacy.

There is an interesting passage in the *Muktāvalī,* p. 122, on the induction by which the *vyāpti* or universal proposition is arrived at. It is to be tested by affirmative and negative induction (*anvayavyatirekau*), which correspond to the methods of Agreement and Difference in Mill's *Logic,* Vol. I. p. 454, the great object being to discover, if possible, the relation of cause and effect between the two phenomena. This is well illustrated in the Comm. On the *Sāṃkhya-sūt.* i. 40, 'The two suggestors of the relation of cause and effect are, (1) this concomitancy of

affirmatives, – that whenever the product exists, the material cause thereof exists; and (2) this concomitancy of negatives, – that whenever the material cause no longer exists, the product no longer exists.' And so in vi. 15, liberation is proved to be the effect of discriminative knowledge, since wherever liberation takes place this knowledge is; but where this knowledge is not, there is no liberation.

85 *Tathā* 'so', 'accordingly', is used in an argument from an affirmative induction, – it introduces an affirmative application, as in the argument in the text. We sometimes find an apparently negative form introduced by the words *na cāyam tathā*; but this, I think, was originally used only in cases of *samaryāpti* (Sāṃkhya s. v. 29), where the middle and major terms are equipollent (ἀντιστρέφει). Thus the following examples of the two forms are given in the Nyāya-bhāṣya, i. 39; the former is the argument from an induction from similar instances (*udāharaṇa-sādharmyāt*), the latter from an induction from dissimilar (*udāharaṇa-vaidharmyāt*).

a. 1. Sound is non-eternal, (*anitya,*)
2. Because it is produced.
3. Whatever is produced is non-eternal, as pots, etc.
4. Sound is thus produced;
5 Therefore it is non-eternal.

b 1. Sound is non-eternal,
2 Because it produced.
3. Whatever is unproduced is eternal, as soul, etc.
4. But sound is not thus unproduced;
5. Therefore it is non-eternal. (Cf. *Bhāṣya*, p. 32)

We should have expected the example of *b* to have run, 'whatever is eternal is unproduced,' but as the two terms 'eternal' and 'unproduced' are equipollent, there is no fault in the argument (see a similar example in *Sarva-darś.-saṃgraha*, p. 82, ll. 1, 2), and, with a slight alteration, it would run as Camestres.

This, however, as it stands, is not properly a negative argument, as it professes to lead to the same affirmative conclusion as the other (cf. *Bhāṣya*, i. 35, and *Nyāya s. Vṛitti*, i. 37). Vātsyāyana expressly leaves the point as an obscure question for future logicians to investigate, and they appear to have altered the form of the argument. They give a different form of the example, *yan naivam tan naivam*, which, however, though negative in its form, is still really affirmative in its effect. This form of the argument views the major premiss or example of the old affirmative syllogism from another side; it not only affirms that all smoke-possessing things have fire, but that no not-fiery things have smoke.

The author of the *Vṛitti* (i. 35) defines the affirmative example (*anvayi-udāharaṇa*) as 'some familiar instance, which, through its having a characteristic [as smoke] which is invariably attended by that major term which is to be established [as fire], proves in consequence the existence, in the subject, of that major term.' The negative example (*vyatireki-udāharaṇa*) is defined in i. 36, 'The example, on the contrary, will be negative from its showing an absence (i.e. of the middle term), which

always accompanies the absence (of the major term).' He gives two examples of the latter (i. 36, 37).

1. This mountain has fire,
2 Because it has smoke.
3. Whatever is not so, is not so, as a lake (i.e. whatever has not fire has not smoke, or, in other words, the absence of smoke always accompanies the absence of fire). [All the paṇḍits read *yan naivam tan naivam*, in p. 30, 8.]
4. But this mountain is not thus possessed of the absence of smoke (*i.e.* it has that smoke whose absence always accompanies the absence of fire);
5. There fore it has fire.

And again,

1. A living body has a soul,
2. Because it has vital air.
3 What is not so, is not so, as a jar (i.e. whatever has not a soul has not vital air, the vital air being, by *Vaiś. sūt.* iii. 2, 4, the sign of soul).
4. But a living body is not thus possessed of the absence of vital air;
5. Therefore it has a soul.

The *Vṛitti* expressly affirms that the conclusion of this apparently negative argument is affirmative; although it adds that some authors held that it should be in a negative form (i. 38), i.e. the conclusions of the two last arguments should be 'therefore it has not the absence of fire,' and 'it has not the absence of soul.' (Cf. The example in Ballantyne's *Tarka-saṃgraha*, p. 51, and also that in *Sarva D. S.* p. 150, ll. 16, 17.)

The simplest form of the *vyatireki-anumāna* or negative argument is that given in the *Siddhānta-muktāvali*, p. 127, 'The mountain has the absence of smoke from the absence of fire,' in accordance with the principle *yo yasya vyāpakaḥ tad-abhāvas tad-abhāvasya vyāpyaḥ*, 'when one thing invariably accompanies another (as fire smoke), the absence of the former is invariably accompanied by the absence of the latter.'

86 Ballantyne has shown that the longer five-membered syllogism of the Hindus is the rhetorical one, while the three-membered is the strictly logical, or, as it is expressed in the *Tarka-saṃgraha*, the former is 'an inference for the sake of another,' the latter is 'an inference for oneself' (Cf. *Tattvachintāmaṇi*, (*Anum. kh.*,) p. 54.) It will then take the form, 'this mountain has fire because it has fire-pervaded smoke,' or rather, as it is more commonly expressed in Hindu books, it will be the enthymeme, 'this mountain has fire, because it has smoke.' This inference is said to be based on *parāmarśa* 'consideration,' which is defined as 'the perceiving that the subject possesses what is pervaded (or constantly accompanied) by some other thing,' – i.e. that this mountain has fire pervaded smoke. The Vedāntic work, *Vedā-paribhāṣā* (p. 17), maintains that the shorter form is sufficient even in 'inference for another.' 'Inference for the sake of another is produced by "deduction" (*nyāya*), and "deduction" is the combination of the members. But the members are here only three, the proposition, the reason, and the example, or the example, the application, and the conclusion, – and not five; as the other two members are superfluous, since these three sufficiently show the

"pervadedness" (vyāptii) and the residence of the middle term in the subject.' For the best account of Hindu logic, see Ballantyne's translation of the *Tarka-saṃgraha*. Röer's translation of the *Siddhānta-muktāvalī* is not equally trustworthy; but his remarks on the Hindu syllogism, *Zeitsch. d. D. M. G.* xxxi. 367–378, are very useful.

87 XI. and X. should be transposed to agree with the order in the original.

88 It is very difficult to determine in the history of Indian logic how far certain parts of the theory are due to the Vaiśeṣika, as distinguished from the Naiyāyika, school. The *Vaiśeṣika-sūtras* discuss certain points of the theory (iii. §1, and ix. §2. 1, 2, 4, as well as incidentally elsewhere), but we nowhere find a complete view of the subject. The author appears to assume the Nyāya's analysis and some of its technical terms, and to confine himself to illustrating certain points. An alliance early took place between the Nyāya and Vaiśeṣika systems, and we find the later theory of the syllogism especially maintained in those books which, like the *Bhāṣā-paricheda* and its Commentary, adopt the Vaiśeṣika and not the Nyāya categories. But this does not prove that these later views were originally Vaiśeṣika. They are not found in the *Vaiśeṣika-sūtras*, except by implication; and Śankara-miśra, in his Comm. On those *sūtras*, frequently refers to the *Anumāna-mayūkha*, a well-known work of the modern Nyāya, for a further account of obscure logical questions (as *e g.* pp. 154, 161, 392), just as the author of the *Siddhānta-mukt.*, devotes pages to maintaining the views as to the syllogism of the great Naiyāyika doctor, Raghunātha-śiromaṇi. The *Tarka-saṃgraha* is not a purely Vaiśeṣika work, but is expressly written 'to perfect the acquaintance of the young with the tenets of Kaṇāda and the Nyāya,' and so too the *Bhāṣā-paricheda* and its commentary.

Chapter 2

On Indian Logic

Max Müller

The sciences of Logic and of Grammar were, as far as history allows us to judge, invented or originally conceived by two nations only, by Hindus and Greeks. All other nations, if they ever cultivated these sciences, received the first impulse from without. The Romans from the Greeks, the Germans from the Romans, the Arabs from the Greeks, the Jews from the Arabs.

That the two most highly gifted nations of the world, the Hindus and the Greeks, should both have been led, each in its own way, to a study of the laws of thought and the laws of language, seems in itself perfectly natural.

At the time, however, when the different systems of Hindu philosophy became first known to the scholars of Europe, at the beginning of this century, everything that came from the East was looked upon as of extreme antiquity. There had been vague traditions of Indian philosophy long before the time of Aristotle. There were reports of early Greek sages travelling to India as the fountain-head of ancient wisdom. Alexander himself had found himself in India face to face with a whole nation of philosophers. It was readily admitted, therefore, that the Hindu system of Logic was more ancient than that of Aristotle, and that the Greeks borrowed the first elements of their philosophy from the Hindus. Alexander, who had been himself in conversation with the Logicians of India, might have sent some of their treatises to his tutor at home, and Aristotle would have worked them up into a system of his own. This view was actually taken and defended by men like Görres.[1] They were struck by many points of coincidence in both systems of Logic. In each there were Categories,

Genus, and Species, and even Syllogisms! It could not be otherwise – the Greeks must have borrowed it from the Hindus. That two nations, if they once conceived the idea of analysing the laws of thought, could possibly arrive at similar results even on the most general points, and that it would require coincidences in many minute details or in palpable errors, to prove beyond doubt that the two systems had a common origin, seems never to have occurred to these enthusiastic Orientalists.

But on the other hand, does it show a higher power of logical reasoning or historical criticism, if we find men like Niebuhr taking the opposite view of the matter, and deriving Indian philosophy from Greece? Niebuhr is reported to have said in his Lectures on Ancient History, "If we look at Indian Philosophy, we discern traces of a great similarity with that of the Greeks. Now as people have given up the hypothesis, that Greek philosophy formed itself after Indian philosophy, we cannot explain this similarity except by the intercourse which the Indians had with the Graeco-macedonic kings of Bactra."

To Niebuhr and to most Greek scholars it would naturally be next to impossible to believe that Greek Logic and Greek philosophy in general were of foreign origin and a mere importation from India. They know how Greek philosophy grew up gradually, how its course ran parallel with the progress of Grecian poetry, art, and civilization. They know that it is a home-grown production as certainly as that Plato and Aristotle were Greeks and not Brahmans.

But, then, a Sanskrit scholar has just the same conviction with regard to Indian philosophy. He can show how the first philosophical ideas, though under a vague form, existed already in the mind of the early poets of the Veda. He can trace their gradual development in the Brāhmaṇas and Upanishads. He can show how they gave rise to discussions, how they took a more distinct form, and were at last fixed and determined in the most scientific manner. He too is as certain that Indian philosophy was a native production of India, as that Gotama and Kaṇāda were Hindus and not Greeks.

Until, therefore, it can be proved *historically* that the Greeks received their philosophy from India or the Indians from Greece – or until coincidences can be pointed out which it is impossible to explain otherwise, it will be best to consider both Greek and Indian philosophy as autochthonic, and to derive from their mutual similarities only this consolatory conviction, that in philosophy also there is a certain amount of truth which forms the common heirloom

of all mankind, and may be discovered by all nations if they search for it with honesty and perseverance.

According to the accounts which the Brahmans themselves give of the history of Indian philosophy, there have been, and there still exist, six systems of philosophy. They are called the Sāṃkhya, Mimāṃsā, Nyāya, Yoga, Vaiseṣika, and Vedānta. These systems are not represented to us in a successive order, they do not apparently arise one upon the ruins of the other, like the schools in the history of Greek and German philosophy. They always seem to run parallel, each maintaining its place side by side with the others, and each representing a distinct view of the Universe, and of the relation of the seeming to the real world. Even at the present day the Brahman unites three or more of them in his course of study.

Each of these systems is complete in itself. Each contains something of what we should call Physics, Metaphysics, Logic, and even Ethics. In one system, however, certain topics occupy a more prominent place, and are discussed at greater length. Thus, while the Mīmāṃsā is more theological, and the Sāṃkhya more metaphysical, the Nyāya system, in which the reasoning faculties of man are more closely examined, has become known to us by the name of "Indian Logic." In India also, a Naiyāyika, or follower of the Nyāya, means as much as a Logician, or a man who understands the laws of reasoning, and still more the art of logical wrangling. The other systems refer to the Nyāya, whenever logical questions have to be settled.

Nevertheless, it would be wrong to call the Nyāya, Logic, in our sense of the word. The Nyāya, as well as the other systems, has for its highest object the solution of the problem of existence, and only as a means towards accomplishing this object, does it devote particular attention to the instruments of knowledge – and, as one of them, to syllogistic reasoning.

In order to explain what in the mind of a Hindu philosopher would correspond to our Logic, it will be necessary to give a short sketch of the Nyāya. We shall there see the exact place which Logic occupies in the system of Hindu philosophy, and be able to judge how far it corresponds to that which Aristotle and other philosophers after him have assigned to this philosophical discipline. The reason why the Nyāya is chosen in preference to other systems, is not because it alone contains an account of the syllogism. The syllogism finds its place in the Vedānta and Sāṃkhya as well; but it is more fully treated by the Naiyāyikas. Again, Kaṇāda's work, called the Vaiśeṣika philosophy, is chosen in preference to the Nyāya sutras of Gotama, because there is

so much of minute technicality in the latter, that it would be very difficult to give a complete account of it in a short compass.

Kaṇāda starts boldly by declaring that he is going to explain how a man can obtain the most exalted and exalting knowledge of reality, and by means thereof arrive at a state of complete blessedness, the Summum Bonum. The way to blessedness, according to him, is knowledge, but knowledge of a particular kind, that is to say, a discriminating knowledge of the seven[2] Categories.

These Categories are, Substance, Quality, Action, Genus, Individuality, Concretion, and Non-existence.

The Sanskrit word which has been translated by category is "*padārtha*," which in common usage means a thing. The etymological signification, however, is "meaning of word," which, if interpreted philosophically, comes to express "the most general meaning of words," "what is common to all words," what is predicated by words without any regard to their special meaning, as given in the Dictionary. Like the Categories of the Greek system, the Padārthas are wide classes of "first intentions." They are the last and highest predicates, and the only thing that can be predicated of them, according to Viśvanātha, is their "perceptibility."

But does this perceptibility involve their reality? We must hear the objections which the Hindu Materialist raises against this supposition. Taking the first category, that of substance, he says, "All we really perceive, if we speak for instance of water, is water. We do not perceive anything of water being a substance. Therefore you have no right to speak of substance as a category." But, answers the Vaiśeṣika, though we do not perceive substance with our eyes, yet we perceive that there must be something in which qualities can reside; something which remains unchanged though the qualities change; – which rests the same whether it becomes a cause or an effect. This then we call substance.

Quality, again, is what resides in a substance. Quality itself has no qualities, but substance has.

Quality produces by itself no change. What produces change, or combination and separation of qualities, is what we comprehend under the third Category, or Action, and this also resides in substance only.

These are the three principal categories, and they seem to correspond very nearly with Aristotle's *οὐσία*, *ποῖον*, and *ποιεῖν*. After these three, follow the two categories of Genus and Individuality.

Genus resides in Substance, Quality, and Action, and it is twofold, higher or lower. The *highest* genus, which is shared by everything, is

"being," the summum genus. Next to it we get as *lower* genus that of being a category, of being substance, earth, a clod, &c.

Individuality is endless. It resides in substance only, and as we shall see, in substance before it becomes material and perceptible by the senses, that is to say, in atomic substances. Individualities mutually exclude each other.

The next category stands as it were by itself, and forms the top of the pyramidal arrangement of the categories, which tapers from the fundamental three, to the qualifying two, and ends in that which we translate by "Concretion." It is peculiar to Indian philosophy, and difficult to be rendered into the philosophical language of Europe. It expresses the intimate relation of things which cannot exist separately. A quality, for instance, cannot exist by itself, but only as the quality of a substance, nor can substance exist except with reference to qualities. Now, substance and quality are not considered as merely together, but as interwoven, as inseparable, and mutually dependent; and this relation is expressed by the category of Concretion. The same relation exists between the whole and its parts, between Genus and Species, between cause and effect.

The last category, which, as we saw, is omitted by some of the Vaiśeṣikas, is that of Non-existence. It is of four kinds, according as it applies to things: 1. Which are not yet, but may be afterwards; 2. Which are no more, but have been; 3. Which are not, and never will be; 4. Which are not what something else is, *i.e.* which differ.

Of these seven categories, which exhaust the universe of knowledge (omne scibile), Substance comprehends the five elements, earth, water, light, air, and ether; it comprehends time and space; soul and self.

The five elements may be either eternal, uncreated, not perceptible by the senses, but established by inference; or created, perceptible, and destructible. In the former state they exist as infinitely small, in the latter they are products. Considered as products again, the elementary substances are threefold; organic, organ, or inorganic. Earth, which is determined as that which has the quality of Odour, exists, as organic, in animal bodies. As organ it is the apprehender of odour. As inorganic it consists in stones. In this manner we get five organs: the organ of hearing corresponding to the substance of ether; that of feeling to the substance of air; that of seeing to light; that of tasting to water; that of smelling to earth. Ether has one quality, and the organ of hearing apprehends one quality, that of sound. Air has two qualities, and the organ of feeling apprehends two, those of sound and tangibility. Light has three qualities, and the organ of sight

apprehends three, those of sound, tangibility, and colour. Water has four qualities, and the organ of taste apprehends four, those of sound, tangibility, colour, and savour. Earth has five qualities, and the organ of smell apprehends five, those of sound, tangibility, colour, savour, and odour.

Here then we have something very like the doctrine of Empedocles,

Γαίῃ μὲν γὰρ γαῖαν ὀπώπαμεν, ὕδατι δ' ὕδωρ,
Αἰθέρι δ' αἰθέρα δῖον, ἀτὰρ πυρὶ πῦρ ἀΐδηλον,
Στοργὴν δὲ στοργῇ, νεῖκος δέ τε νείκεϊ λυγρῷ,

only carried out to too great an extent, and thereby caricatured. The only remark which it is necessary to make is, that "ether" is treated differently from the other elements. While the other four elements exist both in an atomic and in a terrestrial state, ether never leaves its transcendental reality, but is eternal, one, and infinitely great (all-pervading).

The next two substances, which, like ether, exist as eternal only, as one and all-pervading, are Time and Space. Time is the cause of what we call Past, Present, and Future. Space is the cause of what we call East, West, North, &c. Both time and space being eternal substances, and eternal only, it follows that they are never perceptible by the organs of the senses.

The eighth substance is Self. It is the substratum of the qualities of knowledge, wish and will. It is twofold, the living Self and the Supreme Self. The Supreme Self is the Lord, the Omniscient; He is One only, free from joy and sorrow. The living Self is attached to different bodies, but it is still eternal and all-pervading. Wherever the body is, there is the living Self; but the living Self itself remains uncreated and external. Its existence can be proved, but it cannot fall under the cognition of the senses.

The last substance is Soul, the cause of perception, of pleasure and pain, and the passions. As Self, though attached to bodies, is all-pervading and infinite, we should not be able to account for the fact of our successive or discursive knowledge. Self, like the Omniscient, would know everything at once, unless there was the soul, through which all impressions must pass in succession and become individualized. Soul, too, is eternal only, but it is endless; – not infinitely great, but infinitely small, and attached, not to the Supreme, but to living Selves only.

It is not necessary to enter into a more detailed account of the substances, for it is clear that there is only one Substance which will

fall under our more immediate consideration, the Substance of Self, and this only as the substratum of the quality of knowledge. It is where the quality of knowledge is examined, that we shall recognise what by European philosophers is treated as Logic.

Before we proceed, however, to that Chapter, we must at least cast a glance at the different headings of the two categories of quality and action.

Qualities are, 1. Colour; 2. Savour; 3. Odour; 4. Tangibility; 5. Number; 6. Dimension; 7. Distinction; 8. Conjunction; 9. Disjunction; 10. Priority; 11. Posteriority; 12. Weight; 13. Fluidity; 14. Viscidity; 15. Sound; 16. Perception; 17. Pleasure; 18. Pain; 19. Desire; 20. Aversion; 21. Effort; 22. Merit; 23. Demerit; 24. Faculty. They are eternal as residing in eternal substances, and non-eternal as residing in material bodies. Knowledge, Pleasure and Pain, Desire and Aversion, Effort, Merit and Demerit, are qualities of the Self only. Perception, Desire, and Effort are eternal as qualities of the Supreme Self, but non-eternal as qualities of living Selves.

Actions are, Lifting up, Throwing down, Contraction, Expansion, and Procession. They exist only in the four elements and in Soul.

The fourth Category, or Genus, is something which resides in substance, qualities, and actions, but is eternal, and as such not sensuously perceptible. It is one, but it always resides in many. It is that by which it becomes possible to comprehend several things into one class, and to predicate something of them, which they have in common. We call this an abstraction; but to the Hindu the Genus of things, or the General, is something real, inherent in substance, or quality, or action, though of course not material or perceptible by the senses. The Genus, therefore, or the cause of what we call general, is conceived as something independent of single objects, though it is known to us only as inherent in the objects of intuition. It is inherent in substances, qualities, and actions, and is perceived by us as we perceive either substances, actions, or qualities. What Kaṇāda means by calling Genus inherent, is, that substances, qualities, and actions cannot exist, not even in their eternal state, without the Genus. The same applies to Individualities, only that they do not inhere in qualities and actions, but in substances only. Individuality is what makes a thing to be itself, and not anything else. And if we hear Kanāda expressing his opinion, that "individualities which mutually exclude one another, exist in substances only," we almost seem to read the words of Aristotle, *τὸ τί ἐστιν ἁπλῶς τῇ οὐσίᾳ ὑπάρχει.*

These five categories would apparently exhaust the meaning of every word, (*padārtha*). If we take, for instance, the word lightning, and ask Kaṇāda what is expressed by it, he would say, first, a substance, and more particularly, an elementary substance. Secondly, a number of qualities, like colour, distance, or dimension. Thirdly, action, and here the action of throwing down, which cannot be a quality, because qualities are always conceived as at rest. Fourthly, a genus; because when we speak of lightning, we imply that it exists not once only, but as a class, which class is a lower genus if compared with light. Fifthly, an individuality; because we mean this particular lightning, which never existed before and never will exist again. Nevertheless, says Kaṇāda, these five categories do not yet contain all that we mean by the word lightning. It is not the mere agglomerate of substance, quality, &c., that constitutes a real conception – but these categories must again be intimately connected or interwoven, before they represent or constitute a reality. The juxtaposition of categories would be a mere abstraction, and it requires the category of concretion to make all the other categories concrete and real. With it, we predicate, not, first substance, then quality, and so on, but we predicate substance as necessitating quality, quality as inseparable from substance, genus inherent in both, and individuality supported by genus. Thus only does a real conception become fully exhausted by categorical analysis.

We now return to a consideration of the qualities, and more especially of that which is called "Knowledge." Knowledge is a quality of the Self in the same manner as colour is of light. It is inseparably connected with it, and is explained as the cause of every conception that is expressed in language. Knowledge is either remembrance or perception. Perception is twofold, right or wrong. Right perception represents the thing such as it is, silver as silver. This is called truth (*pramā*). Wrong perception represents the thing as the thing is not, mother-o'-pearl as silver.

Right perception is fourfold, sensuous, conclusive, comparative, and authoritative. It is produced by the senses, by inferring, by comparing, and by revealed authority. This fourfold division of knowledge is taken from Gotama and not from Kaṇāda. Kanāda admits but two sources of knowledge, perception (*pratyakṣa*) and inference (*laiṅgika*); that is to say, he comprehends all knowledge which does not arise from the senses, under the general title of inference. The different systems of Hindu philosophy have been arranged by Colebrooke, according to what each considers to be the

only trustworthy means of knowledge. The Cārvāka or Materialist admits but one source of knowledge, sensuous perception. The Buddhist and the Vaiśeṣika admit two, perception and inference. Manu (xii. 105) and Sāṃkhya philosophers admit three, for they acknowledge, besides perception and inference, the authority of revelation. The followers of Gotama add comparison as a fourth instrument of knowledge; the Prabhākaras presumption as a fifth, and the Mimāṃsakas privation or negation as a sixth. To the Self it is indifferent whether its knowledge is produced by any one of these instruments, as long as each represents the thing such as it is.

We pass over the chapter on causation, which serves as an introduction to the chapter on sensuous perception. Nor do we enter into the intricacies of sensuous perception, of which six different kinds are enumerated and explained. They arise from the different ways in which the organs of sense are brought into contact with their objects, which objects may be either substantial matter, or qualities and actions, as inherent in substance, or the Genus, as inherent in substances, qualities, and actions.

After sensuous knowledge comes conclusive knowledge, which is gained by means of inferring. Conclusive knowledge is, for instance, "This mountain is a volcano," whereas our sensuous perception is only that the mountain smokes. In order to arrive from this at the conclusion that it is a volcano, we must be in possession of what is called a pervading rule, or a Vyāpti. This pervading rule, which sometimes might be called a law, is, that smoke is inseparably connected with fire, or, as the Hindu calls it, that smokiness is pervaded by fieriness, that wherever there is smoke there is fire. If we possess this Vyāpti, which we may remember by such instances as a culinary hearth, &c., then, in order to arrive at conclusive knowledge, we only require consideration (*parāmarśa*) in order to find out in any sensuous impression something which can be pervaded, something which can make the mountain the member (pakṣa) of a Vyāpti (this Vyāpti being, "wherever there is smoke there is fire"), then we know conclusively that this mountain is fiery, because it smokes.

It would have been easy to translate these definitions into more technical language. We might have clothed Kaṇāda in a Grecian garb, and made him look almost like Aristotle. Instead of saying, that conclusive knowledge arises from a consideration that there is something in an object which is pervaded by something else, and that the pervading predicate is predicable of all things of which the pervaded predicate is, we might have said, the conclusive knowledge

that S is P, arises from the consideration that S is M, and M is P, or with Aristotle, ὁ συλλογισμὸς διὰ τοῦ μέσου τὸ ἄκρον τῷ τρίτῳ δείκνυσιν. What Kanāda calls member of a pervasion (*pakṣa*, e.g. mountain), we might have translated by subject or terminus minor; what pervades (*vyāpaka* or *sādhya*, e.g. fieriness), the predicate or terminus major; and what is to be pervaded (*vyāpya*, e.g. smokiness), the terminus medius. But what should we have gained by this? All that is peculiar to Indian Philosophy would have been eliminated, and the remainder would have looked like a clumsy imitation of Aristotle. *Multa fiunt eadem sed aliter*, and it is this "aliter" which constitutes the principal interest in a comparative study of philosophy. Even such terms as conclusion or syllogism are inconvenient here, because they have with us an historical colouring, and throw a false light on the subject. The Sanskrit *anumāna* is not συμπέρασμα, but it means "measuring something according to something else." This is done by means of "*parāmarśa*," which means "groping," or trying to find in an object something which can be measured by something else, or which can become the member of a pervasion. This corresponds to the discovery of a terminus medius. In Kapila's system (I.61), the principal object of inference is said to be transcendental truth. Things which cannot be seen with our eyes, are perceived by inference, as fire is from smoke, and he defines inference (I. 101) by "knowledge of the connected, arising from perception of a connection or a law." But, again, the relation of what pervades and what is pervaded is very different from what we should call the relative extension of two conceptions. This will become more evident by what follows. For the present we have learnt, that the act of proving (*anumāna*) consists in our knowing that there is on the mountain fire-pervaded smoke. Through this we arrive at *anumiti* or conclusive knowledge that the mountain is a volcano.

What follows is translated from Annambhaṭṭa's *Compendium*. "The act of concluding is twofold, it being intended either for one's own benefit or for the benefit of others. The former is the means of arriving for oneself at conclusive knowledge, and the process is this. By repeated observation, as in the case of culinary hearths and the like, we have obtained the general rule (*vyāpti*), that wherever there is smoke there is fire. We now approach a mountain, and wonder whether there might not be fire in it. We see the smoke, remember the general rule, and immediately perceive that the mountain possesses fire-pervaded smoke. This is, as yet, called only groping after signs (*lingaparāmarśa*). But from it arises the conclusive knowledge, that

the mountain itself is fiery. This is the actual process when we reason with ourselves.

"If we try, however, to convince somebody else of what we know to be conclusively true, then we start with the assertion, The mountain is fiery. Why? Because it smokes; and all that smokes, as you may see in a culinary hearth, and the like, is fiery. Now you perceive that the mountain does smoke, and hence you will admit that I was right in saying, that the mountain is fiery. This is called the five-membered form of exposition, and the five members are severally called, 1. Assertion, the mountain has fire; 2. Reason, because it has smoke; 3. Proposition, all that has smoke has fire; 4. Assumption, and the mountain has smoke; 5. Deduction, therefore it has fire. The means of inference in both cases is the same. It is what was called the groping after signs, or the handling of the demonstrative tokens, in which the essential process of inferring consists."

What is called by Annambhaṭṭa the conclusion for oneself, corresponds totidem verbis with the first form of Aristotle's syllogism:

All that smokes is fiery,
The mountain smokes;
Therefore the mountain is fiery.

What is called the conclusion for others seems more irregular, on account of its five members, and of the additional instances, which seem to vitiate the syllogism.

We must not forget, however, that whatever there is of Logic in these short extracts, has but one object, that of describing knowledge as one of the qualities of the Self. Knowledge, as Kaṇāda has shown, is not confined to sensuous perceptions, and therefore knowledge gained by inference is examined next. The question is, how is it that we know anything beyond what we perceive with our senses? The answer is, by inferring. If we place ourselves on this point of view, which Kaṇāda has taken, it becomes clear, first, that we cannot expect from Kaṇāda a treatise on formal Logic. The formal Logician takes a purely scientific interest in the machinery of the human mind. He collects, arranges, and analyses the functions of our reasoning faculties, as they fall under his observation. But the question which occupies Kaṇāda is, how is it that we know things which we do not see, and how can we prove that we do know them? Now the instrument by which we know things which we do not perceive with our senses, is inference. Hence, Kaṇāda has to explain first, what inference is, and how we do infer; secondly, how far inference can be made to yield the same certainty as

our sensuous impressions. For this purpose, it seems that neither the deductive nor the inductive syllogism, if taken by itself, would have been sufficient. Deductive reasoning may in itself be most valuable for formalizing facts, it may give a variety of different aspects to our knowledge, but our knowledge will never be substantially increased, no new fact will ever be discovered by it. And if on one side Kaṇāda cannot use deduction because it teaches nothing new, he cannot use induction either, at least not in its general acceptation, because it teaches nothing certain.

The only object of all knowledge with Kaṇāda, as we saw before, was absolute truth, or *pramā*. Now Aristotle does not make a secret of it, that the *ἐπαγωγή*, in order to prove the *ὅλως*, must be *διὰ πάντων*, and that this is impossible, Knowledge gained by epagogic reasoning is, strictly speaking, always *ἐπὶ τὸ πολύ*, not what Kaṇāda would call *pramā*. The conclusion which Aristotle gains by way of induction, "Animals which have little bile are long lived," might be called a Vyāpti. Aristotle arrives at this, by saying, man, horse, and mule are long lived (A); man, horse, and mule (C) have little bile (B); therefore all animals with little bile are long lived. But Kaṇāda would express himself in a different way. He would say, wherever we perceive the attribute of little bile, we also perceive the attribute of long life, as, for instance, in men, horses, mules, &c. But here he would not stop, but he would value this Vyāpti merely as a means for establishing a new fact; he would at once use it as a means of deduction, and say, "Now the elephant has little bile, therefore is he long lived."

One thing can be said in favour of the Indian method. If we go on accumulating instances, as in the case before mentioned, if we add horses, mules, men, and the like, we approximate more and more towards a general rule, but we never eliminate real exceptions, not to speak of possible exceptions. The Hindu, on the contrary, by saying, "Wherever we see the attribute of little bile, we observe long life," and then giving a number of instances by way of illustration, excludes the reality, though he does not exclude the possibility, of exceptions. He states it as a fact, that wherever the one had been, there has been the other, which throws, the onus probandi as to a case to the contrary, upon the other side. In our system, there is nothing to force an opponent to admit a hundredth case, because in ninety-nine cases the rule happened to be true – while, if it is impossible to attack the "Wherever" of the Hindu, there is in this Wherever a real power that brings conviction for every case that comes under it. If it can be proved that there never was an instance where smoke was seen

without fire, the mutual inherence and inseparable connection of smoke and fire is established more stringently than by any number of accumulated instances where the two have been seen together. The conditions under which it is allowed to form a Vyāpti, that is to say, to form Universals, have occupied the attention of Hindu philosophers more than any other point in Logic. They distinctly exclude the mere accumulation of observations. For things, they say, may be together a hundred times, and may still not be mutually inherent. They make exceptions for practical purposes. Their repeated observations may be turned into a general rule, but not in philosophical discussions. Volumes after volumes have been written on this subject, and though I do not believe they will throw new light on the question of the origin of Universals, yet they would furnish a curious parallel to the history of the European Intellect.

It will be necessary, before closing these remarks, to say a few words in answer to the attacks which have been made on Indian Logic.

It has been said that the instances which occur in the third member of the five-membered argument, vitiate the conclusion. The proposition that wherever there is smoke there is fire, was supposed to lose its universal character if it was followed by an instance, "as in the culinary hearth." Against this we have to remark, first, that according to Hindu logicians, this instance is not essential, and is therefore occasionally left out altogether. Next, the instance is never used to confirm the universal proposition, but to illustrate it, and for this very reason it is chiefly used in rhetorical inductions. From the Sūtras of Gotama (I. 35), it might certainly appear, as if the object of the third member was to give an instance. He says, "the proposition, or the third member, is an instance which, from the fact that smoke accompanies fire, shows that fire must be there." However, the Commentator explains that this is not strictly a definition of the third member, but merely an explanation. What the third member supplies is a statement that fieriness pervades smokiness, together with an example to make the connection between them more apparent.

In the original work of Kaṇāda, of which the Library of the East India House possesses a MS., containing text and commentary, we see still more clearly that the third member is simply an universal proposition. We read there (p. 76, a), "Inference is twofold, either for oneself or for others. That for others consists of five sentences which are called Assertion, Reason, Proposition, Assumption, and Deduction. Assertion does not mean more or less than the wording of the conclusive knowledge which is to be established. Reason is that

member which expresses in the ablative the means of proof. Proposition is the third member, which shows that the means of proof and what has to be proved by it are never one without the other. The Assumption shows that the means of proof (heretofore determined as inseparable from what is to be proved) belongs to the subject of our assertion And the Deduction shows that therefore what is to be proved belongs to the subject. The argument therefore proceeds in the following way: A word is non-eternal; a word possesses the quality of being composed, such quality being pervaded by non-eternity; therefore a word is non-eternal." He further states that the names of the five members mean with the Vaiśeṣikas, Promise, Pretext, Authority, Scrutiny, and Repetition

In Kaṇāda's system, therefore, it would seem as if the instance, belonging to the proposition, was altogether ignored, and we might feel inclined to admit that it occurs only incidentally in Gotama's philosophy. But if we inquire more carefully, we find that the instance in Gotama's syllogism has its own distinct office, not to strengthen or to limit the universal proposition, but to indicate, if I may say so, its modality. Every Vyāpti must, of course, admit at least one instance. These instances may be either positive only, or negative only, or both positive and negative. If it is said, "The jar is nameable, because it is knowable; everything that is knowable is nameable;" we can only have positive instances, as tree, table, and the like. It is impossible to bring a negative instance of something which is not provable, because everything is provable On the contrary, if we have a case, like "Earth is different from all the other four elements, because it has odour," it is impossible to go on – "All that is different from the other elements has odour," – because the only case in point would again be "earth." Therefore we must here employ the negative Vyāpti, and say, Whatever is not different from the other elements, has no odour, and then it is possible to add an instance, namely, water, light, &c. After this the Hindu proceeds, Now earth is not so (not inodorous); Therefore it is not so (not different from the other elements).

Brahmans have been told by European Logicians that they could have all this more cheaply, by saying, "Whatever is odorous differs from the other inodorous elements;" "Earth is odorous;" "Therefore earth differs from the others " But the Vaiśeṣika stops us at the very first word, he does not admit the "Whatever," because it is not a "Whatever," but only one single case. It would be impossible to give instances, nay, to give a single instance for the Vyāpti, proposed by the European Logicians, except earth over again.

The third case is, where the Vyāpti admits both of positive and negative instances, as in the hackneyed syllogism of the volcano. Here we can say, Wherever there is smoke, there is fire, as in culinary hearths and like. And wherever there is no fire there is no smoke, as in the lake.

So much for the instances added to the third member, which were supposed to vitiate the syllogism.

Still more unfounded is another objection. It was said that the formalities of the Science of Logic were perfectly satisfied with three out of the five members of the Indian syllogism. Of course they are, and the Hindus knew this 2000 years ago. We have seen that the five-membered method was employed when a person, after having himself arrived at conclusive knowledge, wished to persuade somebody else of the truth of his belief. Now, if "the sole object of Logic is the guidance of our own thoughts, and the communication of those to others is under the consideration of Rhetoric," it is clear that the scheme of the five-membered syllogism belongs to Rhetoric and not to Logic. Whether or no the five steps as they follow one another, according to Kaṇāda, represent what does actually take place in a well-conducted argument, we may leave to Rhetoricians to decide. But, in order to show that even this far-fetched objection would not take the Brahman philosopher by surprise, we quote the following passage from the *Vedānta-paribhāṣā*: "Inference is twofold, intended either for ourselves or for others. The former has been explained. As to the latter, it is to be accomplished by means of an argument. An argument consists of several members. And real members there are only three; assertion, reason, proposition; or proposition, assumption, and deduction Not five; for three are sufficient to exhibit the pervading rule and its two members, the other two can therefore be dispensed with " Now, in the first case, which would give us "the mountain is fiery, for it smokes, all that smokes is fiery," it must be admitted there would be a want of all syllogistic arrangement The first two members might be called an Enthymema, but then the third would be superfluous. But the fact is that Hindu philosophers never use the three members in this succession; and if they say, that the first three are sufficient for a conclusion, they take no account of their successive collocation, but simply mean that Proposition, Assumption, and Deduction. But, although the Hindu Logicians admit, in common with their brethren in Europe, that a complete syllogism consists of three members, they do by no means restrict themselves to the use of the three-membered syllogism. Gotama, for instance, says there are

three kinds of syllogism, from cause to effect, from effect to cause, and from the Special to the General. Thus we infer that it will rain from the rising of clouds; that it has rained from the rising of rivers; we infer that a thing is substance because it is earth. But, with the exception of the last case, it would be impossible to frame an absolute proposition, or a Vyāpti, from which the deductions could be established.

So much in answer to objections which have repeatedly been made against Indian Logic. I should like to see the Brahmans themselves take up the gauntlet and defend their Logic against the attacks of European critics. Till very lately they entertained a very low opinion of European Logic, some account of which had been supplied to them from the popular work of Abercrombie. The European style is to them not sufficiently precise. The use of an abstract, instead of a concrete term, is enough to disgust a Brahman. Besides, he wants to see all results put forward in short and clear language, and to have all possible objections carefully weighed and refuted. By the exertions of Dr. Ballantyne, the Principal of the Sanskrit College at Benares, some of the best English works on Logic have been made accessible to the Pandits, and at the present day we might hear the merits of Bacon's Novum Organon discussed in the streets of Benares. Indian Philosophy therefore should not be attacked at random. Thales or Empedocles can be criticised in the schools with impunity, but Kaṇāda and Gotama may still find champions in India, if not in Europe.

NOTES

1 Görres undertook to prove that the Greeks had borrowed some technical terms from the Sanskrit. Indian philosophers admit five elements, and the fifth is called *ākāśa*, ether. This ether has quite a different meaning from the *αἰθήρ* which some Greek philosophers considered as the fifth or highest element. Görres, however, quotes (without giving a reference) a passage from Aristotle, where this fifth element is mentioned under the name of *ἀκοτ-ονοματον*, and this he translates by "akās-nominatum," – *ἀκοτ-ονοματον* being evidently an ingenious conjecture for *ἀκατονόματον*.

2 Originally there were but six, Non-existence being omitted in Kaṇāda's Sūtras. The statements given here are taken from Annambhaṭṭa's *Tarkasangraha*, published at Benares without the name of the editor. This publication, and many most valuable works lately issued from the Sanskrit College of Benares, are due to Dr. Ballantyne, the Principal of this College. A Hindostani translation, together with an English translation, was also published at Benares, from the hand of Mr. Fitz-Edward Hall, though without his name.

Chapter 3

A Note on the Indian Syllogism

H. N. Randle

The western syllogism has the appearance of having sprung all at once into existence, from the head of Aristotle, clad in complete mail. It has about it no marks of the labour of thought which brought it to birth, and seems more like a work of art than an organism with an evolution behind it. The Indian 'syllogism,' on the other hand, is an organism with its history plainly recorded in its structure: an untidy organism, too, with vestigial structures and rudimentary organs which are changing their functions while preserving more or less of their primitive form. And for this reason, perhaps, it may have something to tell us about the 'morphology' of thought which is not so transparently conveyed by the more perfect work of art, the Aristotelian syllogism. The more untidy organism may therefore repay study.

The Indian syllogism has neither Mood nor Figure.[1] It has what can be recognised as *corresponding* to the three terms of the Aristotelian syllogism. The 'major term' is denominated the Probandum, and the 'Subject' (or 'minor term') is defined as "that which has the Probandum doubtful."[2] What corresponds to our middle term is called by various names signifying Probans, Mark, Reason. But the Indian logician does not abstract M and P from their concrete embodiments; and he therefore distinguishes SM, or the Probans as it occurs in the Subject or minor term, from XM's, i.e., the Probans as it is found in other concrete cases. And this becomes important in the case of an unlimited probans such as 'existence' or 'knowability'; or again in the case of a probans which is a peculiar property of the Subject, as 'audibility' when used to prove some conclusion about

'sound' For, in the former case, there are no X non-Ms, and in the latter there are no XMs: which, on the Indian view of syllogism as an argument from Examples, casts a doubt on arguments employing such Probans.[3]

It is convenient to use symbols, and the familiar S, M, and P will serve: but the Indian logician did not use them, and they tend to misrepresent his point of view. The appellations major, minor, and middle term, are also misleading, at any rate in speaking of the earlier logic. The earlier[4] Indian logician never considers the distribution and quantification of the terms in the syllogism, and the way of regarding subsumptions which is exemplified in Euler's circles, and which is second nature to us trained in the formalism of Western school logic, does not seem to have entered into his account of syllogism. The whole business of conversion and immediate inference, essential to our formalism, is unknown to Indian logic, so far as I am aware. It is therefore a mistake to equate the Indian logician's list of fallacies with our Undistributed Middle, and Illicit Process. And because his syllogism has no doctrine of Figures[5] it is undesirable to equate his arguments with Barbara, Celarent, etc.

After this statement of what Indian logic is not, it might seem that there is little left for it to *be*, at any rate as an 'art'; and it might seem that it can have no content worth mention. How could such a logic provide Rules and Canons of syllogism or any criteria for distinguishing valid from invalid subsumption? The doubt may seem to find confirmation in memories of the Indian syllogism as quoted (quite correctly) in some of our manuals of logic – a cumbrous affair of five propositions, two of which seem vain repetition, while the 'major premise' is stated in an apparently unnecessary double positive-negative form, and supported by examples always – apparently – superfluous, and sometimes puerile.

1. That hill is on fire,
2. Because it is smoking; –
3. As smoke and fire go together, on the hearth, while non-smoke and non-fire go together, in the lake,
4. So here: [so *not* here:]
5. Therefore is that hill so, i.e., on fire.

(The reference of course is to forest fires in the mountains.)

That seems to have been the early form of the syllogism[6] – a *paradeigma* or argument from particular to particular through likeness or unlikeness; and yet on its way to becoming an explicit

'deduction' from a universal connection, or *vyāpti*, 'Pervasion' of smokiness by fieriness. This element of *vyāpti* later came to be more and more emphasized, until the example got the appearance of an excrescence, although always retained as an element in the third member of the five-membered syllogism. The third member then took the form:

> All that is smoky is fiery, as the hearth; and all that is not fiery is not smoky, as the lake.

That is, the element of analogy is now obscured, for the 'so'[7] of the fourth and fifth members no longer appears as correlative of the 'as' in the third member, but as a mere demonstrative standing for the M and P of (what is now) the major premise. And the third member has now crystallized into a formula with the order of terms fixed:

> All M is P and All non-P is non-M.

It is in this developed form that the Indian syllogism is quoted in European books. The European reader then says to himself: "This of course is a combination of a syllogism in Barbara with a syllogism in *Cesare*:

> All that is smoky is fiery
> This hill is smoky
> Therefore it is fiery
>
> *and*
>
> Nothing that is not-fiery is smoky
> This hill is smoky
> Therefore it is not non-fiery, *i.e.*, it is fiery.

One of these syllogisms is unnecessary: the two examples are superfluous: and the first two members are identical with the last two and serve no purpose."

All these three criticisms have been anticipated by Indian logicians. As regards the last, a distinction was made between 'inference for oneself' and 'inference for another' (i.e., the setting out in words of a reasoned belief for the instruction of others), and the five-membered syllogism was by some logicians confined to 'inference for another'.[8] Ordinarily all schools state their inferences with the utmost possible brevity, in the form: "The hill is on fire, because smoky; like the hearth." But it will be noted that the *example* is retained, even in this abbreviated form.[9] The third

member was always called, not after the statement of concomitance which is contained, but after the illustration of that concomitance included in it: that is, it was known as the *Example* (*udāharaṇa*). The five members of the full syllogism were called (1) the Proposition, (2) the Reason, (3) the Example, (4) the Application, (5) the Conclusion.[10] For us it is the 'major premise' that conveys the relation of the middle to the minor; for the Indian logician it was always the 'Example' that carried this function.

And that is why (to revert to the second of the three criticisms brought against the Indian syllogism) the third member has the double positive-negative form. It certainly would be superfluous to state in a '*major premise*' not only that All men are mortal but also that No immortals are men; because, as the Indian logician was well aware,[11] the one form implies the other. But so long as the weight of your argument is felt to be carried by the *example*, the case is different: and it is now necessary to give two examples, one of positive concomitance of M and P, and the other of negative concomitance – one an XMP, the other an X non-M non-P. For an example of negative concomitance is adduced at the same time, then, *under certain conditions* your *paradeigma* may amount to a demonstration of the conclusion.

What are these conditions? How far was the Indian logician able to formulate them without that apparatus of mood and figure and distribution of terms which constitutes formal logic for the western schoolman? Is there any way of laying down syllogistic canons other than that of the Dictum de Omni et Nullo?

If Example is made the nerve of demonstration, the validity of the argument will obviously depend on whether or not a concrete *enstasis*, or 'instance' in the shape of a *counter-example*, is forthcoming. The material with which logic, so conceived, would work, would be Positive Examples (MP), Negative Examples (non-M non-P), and 'Instances' in either of two forms (M non-P, and non-MP). And the Canons of the syllogism, conceived thus as an affair of Examples and Counter-examples, would consist in a statement of *what examples, in the absence of what 'instances*,' will establish a valid conclusion.[12] Such Canons are to be found in a doctrine of the Three Characteristics of the Reason (*trirūpahetu*) formulated both by the Buddhist logician Dignāga[13] and the orthodox philosopher Praśastapāda, perhaps about 400 A.D.; and passing through their formulations into the general logical stock-in-trade of the Indian schools.

The three characteristics which the middle term must have are:

1. It must reside in the Subject[14]
2. It must reside in Positive Examples only.[15]
3. It must be only[15] absent in Negative Examples.

The formulation of the Second and Third Canons is a clear case of botching, and the double use of 'only' is where the botching comes in. And the word *only* in both cases may well be the addition of a botcher who was trying to make a *paradeigma* do what it by its very nature could not do, i.e., give a guarantee that no contrary case *could* be produced. You cannot prove '*only*' by examples. The utmost you can do is to challenge an opponent to produce his contrary case, his XM non-P, yourself producing cases of X non-P which are *non-M*. When you have done this you have exhausted the possibilities of your method. Experience has shown MPs. It has *not* shown M non-Ps. On the contrary it shows non-M non-Ps. And there you have the natural Canons of a syllogism which remains an affair of examples and counter-examples.

Of course there is an inclination to interpret the *Trairūpya*, the Three Characteristics, in terms of the *Dictum de Omni et Nullo*, as an affair of 'distribution of terms'; and I do not deny that there were tendencies in Indian logic itself towards the quantitative view embodied in the *Dictum*. And yet I think that the best way to understand the spirit of the *Trairūpya* is to forget the *Dictum*, and to interpret the Indian formulation of the syllogistic canons in the light of the original Indian conception of syllogism,[16] which has no terms and no notion of their distribution. It is in this light rather than in the light of the *Dictum* that we can best understand the List of Nine Valid and Invalid types of Syllogism, contained in Dignāga's tract entitled the *Wheel of Reasons Set in Order* the nearest approach that I know of in Indian logic to our *Barbara*, *Celarent*, etc. The nine arguments represent all possible 'moods'[17] of the syllogism, invalid as well as valid, so that Dignāga's syllogism has at least the advantage of parsimony compared with ours. Two are valid. Five come under the head of *Inconclusive*.[18] Two come under the head of *Contradictory*.[18] The topic of all nine Types is the same the eternity or transitoriness of sound: which means nothing to us, but was a much discussed question in the Indian schools. The nine arguments which follow will be found in a diagram facing page 100 of Dr. Vidyābhūsana's book. They are there arranged as follows: but I am not clear whether the arrangement in a square is Dignāga's or Dr. Vidyābhūsana's:

The Wheel of Reasons.

I	II	III
Inconclusive (unlimited).	VALID.	Inconclusive (too wide).
IV	V	VI
Contradictory	Inconclusive (too narrow).	Contradictory.
VII	VIII	XI
Inconclusive.	VALID.	Inconclusive.

No. I. Sound eternal because an object of knowledge. (Inconclusive.)
Positive example XMP .... Ether.[19]
Negative Example (None is possible, for nothing can be quoted which is not an object of knowledge.)
Counter-Example XM non-P ...... A pot.

No. II Sound non-eternal because produced. (VALID.)
Positive Example XMP .... A pot
Negative example X non-M non-P . Ether.
Counter-Example .... (None is forthcoming.)

No. III. Sound an effect of effort or volition, because non-eternal. (Inconclusive.)
Positive Example XMP .... A pot
Negative example X non-M non-P . Ether.
Counter-Example XM non-P ...... Lightning

No. IV Sound eternal, because produced. (Contradictory.)
Positive Example .... (None forthcoming.)
Negative Example .... (None forthcoming.)
Counter-Example XM non-P ..... A pot
Counter-Example X non-MP ..... Ether
(The two counter-examples provide the material for argument No. II, leading to the contradictory conclusion.)

No. V. Sound non-eternal, because audible. (Inconclusive.)
Positive Example .... (None is possible in this Type, known therefore as 'the too restricted reason'. There is no XM, but only SM, since audibility is the peculiar property of sound.)
Negative Example X non-M non-P . Ether
Counter-Example X non-MP ...... A pot.
(But of course no Counter-Example in the fatal form of XM non-P will be forthcoming, as there are no XMs. The case must be argued in the field of non-Ms.

No. VI. Sound eternal, because an effect of effort (Contradictory.)
Positive Example .... (None is forthcoming.)
Negative Example X non-M non-P . Lightning.
Counter-Example XM non-P ..... A pot.
Counter-Example X non-MP ...... Ether.
(The two Counter-Examples provide the material for argument No. VIII., leading to the contradictory conclusion.)

No. VII. Sound a non-effect-of-effort, because non-eternal. (Inconclusive.)
Positive Example XMP .... Lightning.
Negative Example .... (None forthcoming.)
Counter Example XM non-P ...... A pot.
Counter-Example X non-MP ..... Ether.
(Here the positive example prevents the two counter examples from establishing the contradictory conclusion, as they do in No. VI, – so that the reasoning is merely inconclusive.)

No VIII Sound non-eternal, because an effect of effort VALID.
Positive Example XMP .... A pot
Negative Example X non-M non-P . Ether.
Counter-Example X non-MP ...... Lightning.
(A counter-example in the form X non-MP does not affect the validity of the argument. Contrast No. III. In the other VALID argument, No. II., there are no non-MP's, because as we should say, the major premise is simply convertible, i.e., all M is all P.)

No IX. Sound eternal, because corporeal; (or, because incorporeal). (Inconclusive.)
Positive Example XMP .... Atoms
Negative Example X non-M non-P Action
Counter-Example XM non-P ...... A pot.
Counter-Example X non-MP ...... Ether.
(If you take 'incorporeal' for the middle term, the counter-examples become the examples.)

Such a list underlines the fact that a counter-example in the form XM non-P is fatal whereas a counter-example in the form X non-MP does not matter: which *amounts* to saying that All M must be P and All non-P must be non-M; whereas it is not necessary that All P should be M and that All non-M should be non-P. From the time of Praśastapāda and Dignāga the latter mode of formulation had established itself and the 'major premise' had crystallized into the two propositions with order of terms fixed and subject 'quantified' – All M is P; All non-P is non-M. But the other way of formulating the syllogism, by example and counter-example, was the original way, and it continued to survive alongside of the new method. Hence the double character of the Indian syllogism (in respect of its third member, the so-called 'Example'), and hence the rather confused

combination in the *Trairūpya*, or syllogistic Canons, of the two points of view. That the syllogism still continued to be regarded as an affair of examples is evidenced by the interpretation commonly put upon the second and third Canons. They were usually interpreted to mean, not merely that all M must be P and that all non-P must be non-M; but further that there must be *actual examples* (other than S) of M being P, and also *actual examples* of non-P being non-M. That is, the second was taken to mean that actual XMP's must be forthcoming; while the third was taken to mean that actual X non-P non-M's must be forthcoming. And these requirements become of obvious importance in the cases of two of the Types of argument given in the Wheel of Reasons, – the argument from an *unlimited* reason (No. I., sound is eternal because knowable): and the argument from a *too limited* reason (No. V., sound is non-eternal because audible). For in the former case *there is no non-M*: and in the latter case *there is no XM*. Indian opinion divided itself in a very significant controversy as to whether arguments in these two types could ever be regarded as valid. It is worth while considering these two types in more detail.

No. I., the unlimited or '*Purely Positive*' Reason.

The example of this given in the Wheel is open to the fatal counter-example of the pot which is of course knowable, and yet not eternal. But if an unlimited middle term is used to prove an *unlimited major* – as, the pot is nameable because knowable, – so that no counter-example in the form XM non-P is forthcoming, is this type of argument still inconclusive? Some rejected such arguments as breaking the third Canon – that the Probans must be absent in negative examples – this being interpreted to mean that there must be negative examples, X non-M non-P. The orthodox school of logic (the Nyāya), however, maintains the validity of such arguments, classing them under a separate rubric under the name 'purely positive' (*kevalānvayin*). The real solution of the controversy no doubt is that the reasoning would be invalid if it were paradeigmatic: and the Indian logician makes syllogism an affair of examples. But in this type of argument the positive 'examples' are as irrelevant as negative examples are impossible. For the reasoning is not by examples at all, but implicative – a matter of 'agreement of ideas,' and not of evidence. And, as such, it is valid reasoning, though invalid *paradeigma*.

No. V., the '*too limited*' or '*Purely Negative*' Probans.

Sound non-eternal because audible. Obviously we could just as well argue that sound is eternal because audible, for no XM can be

adduced, since the M, audibility, is the peculiar property of the S, sound. The argument is therefore confined to negative cases, X non-M's, things that are not the object of the auditory sense – and of these some are eternal and some are not. (Sound itself of course cannot be used as an example, SMP, for S, the minor term, is by definition "that which has the probandum *doubtful*")

But suppose that in the sphere of negative cases, X non-M's, as a matter of fact P is *not* found, so that no enstasis to the experience X non-M non-P is forthcoming (in the form of a counter-example X non-MP). The Nyāya school, which defends this type, under a rubric of 'Purely Negative' Probans (*kevalavyatirekin*), adduces as an instance of a valid inference in this type the argument "The living organism has a soul because it has vital functions." No positive example can be quoted, other than the living organism itself, of things possessing vital functions. But within the sphere of things *not* possessing vital functions – pots and the like – no one would assert the existence of soul: so that to the negative example X non-M non-P no enstasis in the form X non-MP is forthcoming.

There is the same division of opinion about this 'Purely Negative' type as there is about the 'Purely Positive' type; some rejecting it as a breach of the second Canon – that the Probans must reside in Positive Examples only: which is interpreted to mean that there must be a positive example, XM. And here again the solution of the controversy seems to be that such arguments are invalid *paradeigmata*,[20] but may still be valid inferences by presumption or implication within a system. Again it is a matter not of evidence and example, but of the agreement of ideas. The Indian schoolman starts from the view that all inference is an affair of examples. He than comes across valid inferences which refuse reduction to the normal type. He therefore invents abnormal types which are paradeigmata only in appearance, in order to provide for these cases.

These two Types are therefore of interest as pointing the moral that a view of inference[21] as subsumption under a major based on 'evidence' goes bankrupt as soon as it has to deal with reasoning that depends, not on evidence, but on the agreement and disagreement of ideas (to use Locke's phrase again). It seems to me that the whole of mathematical reasoning would have to go into the purely negative Type – with ludicrous results. If I wanted to prove that five and seven are twelve, I should probably say to myself "twice five are ten; and two makes twelve". No positive example is available, other than seven *plus* five itself. And to argue negatively that six and seven, etc.,

are not twelve, and therefore five and seven *are*, does not recommend itself as a reasonable alternative.

The moral is pointed so plainly by Indian logic, just because Indian logic insisted on the concrete examples which the western syllogism finds superfluous. What the Indian logician says, in effect, is: "If you are going to have an argument which you can call a valid 'syllogism,' you must be in a position to support your 'major premise' by concrete cases other than the Subject or minor term." The western student would retort: "If you have a genuine universal – a *vyāpti* – for your major, the citation of examples is perfectly irrelevant. *Your* syllogism is a cross between an indecisive analogy or argument from particular to particular on the basis of similarity, and a cogent deduction from a universal principle on the basis of identity of nature."

The question cannot be profitably debated further without asking the critic of the Indian syllogism whether he supposes the major premises of *his* syllogisms to be always derived from particular cases – examples – by induction. If his answer is in the affirmative it seems to me that he has no case against the Indian view of the syllogism as an affair of examples. And Mill in his criticism of the syllogism is in fact practically affirming what the Indian formulation affirms – that the reasoning is from particular to particular, since the major premise adds nothing to the *evidence* for the conclusion. The evidence is the Examples The critic's syllogism is then a hybrid, being no more than a *paradeigma* which conceals its humble origin in the particular by suppressing those Examples on which the Indian syllogism insists

A subsumption of this sort, at any rate, *i.e.*, under an inductively established major, such as the Indian syllogism confessedly is, and such as our text-book syllogisms for the most part really are, is a relatively inferior form of inference: and so it has not been content to remain within its own nature, but has reached out towards more cogent forms of inference It has done this by substituting an explicit formulation of the universal for the concrete embodiments of it from which, as *paradeigma*, it really argues: and then, in the western school logic, by substituting the purely quantitative or mathematical[22] cogency of the relation between container and contained in the place of the cogencies of real relationship which are in truth the nerve of inference

But in thus passing from an affair of examples into an affair of quantitative relations the paradeigmatic syllogism achieves a pseudo-cogency only at the cost of ceasing to be syllogism in any sense whatever. For it now becomes the education of quantitative relations

or correlates within a purely quantitative system; and the major premise is no longer (what it purports to be) the principle from which the conclusion is *deduced*: but becomes just one of the quantitative data from which (in accordance with *implicit* mathematical principles) a quantitative result is *educed*. *Quantitatively considered*, the syllogism is no more syllogistic than are such arguments as 'A is to the north of B, and B is to the west of C, therefore A is to the north-west of C'. It is as purely 'relational' an inference as *they* are. And surely no light is thrown on the inner nature of all possible inferences by an attempt to throw them all into the common form of a problem of quantities – an affair of 'All and None'.[23]

With the development of the doctrine of *vyāpti* or universal connection explicitly formulated, and with the substitution of the category of Class Nature (*sāmānya*) for Similarity (*sādharmya*) as the principle of syllogistic inference, Indian logic took the step which leads naturally to the quantitative view of the syllogism. But it developed a formalism[24] along different lines, and never elaborated the quantitative concept in the manner of the western school logic. The western formalism seems to me (partly no doubt owing to its familiarity) as a very much more efficient 'dodge': though I do not think it can claim to be a more philosophical formulation of subsumption than the Indian syllogism. Indeed, the retention of the 'Example' may be regarded as having given the Indian 'syllogism' a better chance of avoiding the fate of becoming a barren thought-form than the quantitative formulation gives it: for the quantitative theory of syllogism can only re-vivify itself in a theory of Induction, that is, in a theory of Example – which is what has happened to it in the West India, however, failed to exploit the advantage of its insistence on the Example because it used its syllogism mainly for ontological and theological reasonings – that is to say, in just that sphere of inference within which 'induction' has least scope, and in which *therefore* the paradeigmatic syllogism is least applicable

Both syllogisms, Indian and Western, have claimed to be the universal type of inference, and in both cases the claim has been questioned. In India the term used for inference is the term used for syllogism (*anumāna*), and therefore the demurrer against the claims of syllogism does not take the form of saying that there are other forms of *inference* apart from *anumāna*, syllogistic inference; but that of saying that there are other instruments of valid cognition (*pramāṇa*) besides (syllogistic) inference, perception, and authoritative testimony (which with Comparison are the four *pramāṇa's* recognized by the

orthodox logical school): but the other means of valid cognition which the critics put forward are in fact other forms of *inference* – for instance *arthāpatti*, Presumption or Implication, the stock example of which is just a disjunctive inference.[25]

Criticisms of this nature have, in India, arisen from the fact that there are types of inference in which '*Example*' plays no part. In the West they rather arise from the difficulty of finding the characteristic *three terms* of syllogism in relational arguments. In both criticisms the emphasis is laid on the difficulty of *formulation* – on the Indian view you cannot find the *example* which the *Trairūpya* requires: on the Western view, you get a *quaternio terminorum* which the Rule of Syllogism forbids.[26]

On the whole the Indian scholastic has shared with the scholasticism of the West the view that syllogism is the ideal and universal type of inference. As regards the two methods of formulating it, my feeling is that the Western scholastic, with his quantitative apparatus of formalism, has been worshipping idols of the theatre not less, but rather more, than the Indian scholastic with his 'Examples'; that the *Dictum de Omni et Nullo* is even further from the truth about inference than the Indian *Trairūpya*, or Three Characteristics of the Middle Term: and that the paradeigmatic syllogism of the Indian schools is on the whole preferable to BARBARA CELARENT.

NOTES

1 But see below, footnote 3.

2 In the earlier logic the word translated literally Probandum, and confined in the later logic to the 'major term,' was applied indiscriminately both to the major and to the minor term. The earliest commentator explicitly says that Probandum means either the Subject qualified by the property-to-be-proved, or the Property-to-be-proved qualified by the subject. This terminology seems to show that the Indian logician did not regard his 'terms' as separable entities: and if he had used symbols (as he never did) he might perhaps have written Sp is sP – instead of our S is P, i.e., the difference between subject and predicate is rather a difference of emphasis within the same complex. It is noteworthy that (so far as I know) Indian logic has no *generic* name for the 'term'. The Indian syllogism has 'Members,' but these are propositions.

Historically, the ambiguity of the word Probandum is due to the fact that it formed the first member of the two compounds *sādhyadharma* and *sādhyadharmin*, – *sādhya* meaning probandum, *dharma* property, and *dharmin* property-possessor. The former compound was used to refer to the 'major term,' and the latter to refer to the 'minor term,' so that the two things were distinguished by the mere difference in the

noun-suffix. But the latter members in these two compounds were ordinarily omitted, so that the first member, *sādhya* = probandum, was left to do double duty as name for both major and minor term. This was so obviously inconvenient that another word, *pakṣa* (side, side to a discussion, thesis), came into use to denominate the minor term, leaving *sādhya* as the appellation of the major.

3 The terms Subject, Probans, Probandum, are borrowed from Dr. Ganganātha Jhā's translation of the *Nyāya Sūtra* and *Bhāṣya* published in *Indian Thought* (Allahabad and Benares, 1912–1920), and separately (Allahabad). This is a work which places all students of these difficult texts under very great obligation to the author.

4 A distinction between the Probans as 'pervaded' (*vyāpya*) and the Probandum as 'pervading' (*vyāpaka*) arose in connection with the doctrine of universal connection – *vyāpti*, Pervasion. But it never developed into a quantitative account of the relation of the terms in a syllogism.

5 A passage in the seventh century Buddhist logical tract *Nyāyabindu* treats of arguments *from Non-perception* as the Probans, as a separate type. These have a negative minor premise and a major of the form All P is M (in place of All M is P). And this is the essential character of the Second Figure. The author first points out that any argument may be put either positively or negatively. He calls the positive form the form 'based on likeness' (*sādharmyavat*), and the negative form the form 'based on unlikeness' (*vaidharmyavat*): which means that in the former case the minor premise has the same 'quality' as the major, in the latter it has the opposite 'quality'. But he adds that a mere change of form marks no real difference in the argument. It is the same thing to say

All M is P
S is M

Therefore S is P (the *sādharmyavat* form): and to say

All non-Ps are non-M
S is not non-M

Therefore S is not non-P (the *vaidharmyavat*). But he notes that there is a particular class of arguments from non-perception as Probans, –

All (possible objects of perception) which are present are perceived
The pot is not perceived
Therefore it is not present, –

in which the *vaidharmyavat* form is the form which the argument will take when the major is stated in the direct or positive form (*anvaya*). This is a genuine CAMESTRES, with affirmative major of the All P is M type.

He points out that you can express it as a *sādharmyavat* argument by putting the major in the indirect or negative form (*vyatireka*):

Whatever (possible object of perception) is not-seen, is not-present,
The pot is not-seen
Therefore it is not-present.

This of course is BARBARA in form – but not in nature. The truth about 'Figures' seems to be clearly enough apprehended here, though the Figure as a 'dodge' was not utilized in the Indian schools.

6 See Prof. A. B. Keith's *Indian Logic and Atomism* (Oxford Univ. Press, 1921), p. 87

7 The earliest commentator says explicitly "the Application – fourth member – is a comparison (analogy), as is shown by the word 'so'".

8 It seems to me clear that this is the meaning of even the earliest commentator, Vātsyāyana, though he does not explicitly formulate the distinction between 'inference for oneself' and 'inference for another'. He never calls the five-membered syllogism 'inference' (*anumāna*), but refers to it as the Probative Statement (*sādhakavākya*). And in a significant passage (I., i. 30) he says that this Probative Statement, or syllogism is a combination of the several means of knowledge (*pramāṇa*): the first member or Proposition being matter of Testimony; *the second or Reason being Inference*; the third or Example being matter of Perception; the fourth or Application being Comparison (also reckoned by some as a separate means of knowledge).

9 It was not uniformly retained. After the full development of the doctrine of universal concomitance or Pervasion (*vyāpti*) a feeling arose in some quarters that the example was superfluous, and it was rejected altogether by a few writers. But this was an abnormal doctrine, and contrary to the spirit of the Indian syllogism.

10 The conclusion is the restatement of the Proposition. A scholiast on the *Prior Analytics* observes that the 'problem' is the same as the conclusion: when put forward with a view to proof as something not known, it is called the problem: when proved it is the conclusion. Brandis, *Scholia*, p. 150, col. 2, 11. 38–46

11 *E.g.*, the Buddhist logical tract *Nyāyabindu* follows up the useful principle that words are not necessary when the thing is understood, with a demonstration that the positive form of the *vyāpti* implies the negative and *vice versa*. Only one need be *stated*. Another work quotes the ingenious observation of a critic of the full syllogism, considered as 'Inference for another,' to the effect that other people's mental processes are difficult to get at, and that it is impossible to say that just so much verbal expression will convey understanding, and less will not.

12 Which amounts to saying that the Canons of syllogism are the Canons of 'induction'. And I believe that this is just what the Indian view of syllogism *amounts* to. Dr. B. Faddegon in his Vaiśeṣika System (Amsterdam, 1918) calls the Indian syllogism a combination of a deduction with a superficial induction. See further on this point below.

13 Otherwise Dignāga, a very interesting figure in the development of Indian logic, on whom see Stcherbatskoi's brilliant article in *le Muséon* (1904), n.s., Vol. V., which has formed the basis of subsequent discussion. Dignāga's works are unfortunately available only in Tibetan versions, but some account of them has been given by Dr. S. C. Vidyābhūsana in his *Indian Logic: Mediaeval School*. I draw my account from this work.

14 In the older writers like Praśastapāda and (perhaps) Dignāga, the word translated Subject was still liable to the ambiguity noted above [the word

used is the equivalent of *sādhya* and liable to the same ambiguity, as meaning either Subject (minor term) or Probandum (major term)]. It is therefore possible, even probable, that the first canon as originally formulated was an assertion of universal connection between Probans and Probandum. Later writers, however, always took it in the sense in which it is translated above, *i.e.*, as the assertion that the Probans must be found in the Subject – S must be M. And this seems so much more likely an interpretation *prima facie* that it seems gratuitous to suggest that it originally had the other meaning. There are nevertheless strong reasons for believing that this was the case – see Keith, *Indian Logic*, pp. 137–138. If so, these Canons present exactly the same double character and the same redundancy as the syllogism itself presents in its third member, the 'Example' so-called, which combines a statement of 'Pervasion' (*vyāpti*) with concrete examples. As Dr. Keith says: "the explanation is perfectly simple. The three conditions represent a precise statement of the third member of the syllogism, the Example, when completed as it was in Praśastapāda's time by the enunciation of the general proposition." Dignāga is credited by modern critical historians of Indian Philosophy with the 'discovery' of the universal proposition, and it is supposed that Praśastapāda borrowed this and much else from him.

15 It is the word translated 'only' in the two latter Canons (Sanskrit *eva*, a particle of emphasis and exclusion) around which controversy as to the exact formulation of these canons has turned.

The Second Canon means that XPs (some, not necessarily all) must be M, and that no counter-example of X non-P being M must be forthcoming.

The third Canon means that X non-Ps (all of them) must be non-M, and that no counter-example of X non-P being M must be forthcoming.

The objection to the formulation is obvious: the 'only' of the Second Canon excludes precisely the same counter-examples as are excluded by the 'only' of the third Canon. And as the Second Canon has already stated, by means of this exclusion, that all XMs must be XPs, there is nothing gained by the contrapositive statement in the third Canon that all X non-Ps must be X non-M's. And I think that the formulation is in fact indefensible.

But it is easy to see how it grew into this form. First there is the need of positive examples, XMPs. Then there is the need of *denying* the occurrence of counter-examples XM non-P. And this denial *can only* take the form of pointing to X non-P non-Ms. the limits of the method are in fact reached when you have pointed to XMPs and then (in answer to the suggested possibility of XM non-Ps) pointed to cases of X non-Ps which are non-M.

16 By which I mean the earliest available account of syllogism. And this is to be found in the *Nyāya Sūtra*, and in Vātsyāyana's Bhāṣya or commentary thereon. Neither can be dated, though Jacobi has attempted to date the Philosophical Sūtras in the *Journal of the American Oriental Society*, Vol. xxxi. (The references in the *Vaiśeṣika Sūtras* are no doubt earlier, but hardly constitute an intelligible 'account' of syllogism.)

17 But they are not 'moods,' rather Types.

18 These are two of three classes of fallacy commonly recognised. A third class of fallacy is the *Unreal* reason, which consists in taking a middle term which is not found in the Subject, and thus constitutes a breach of the first canon. This class of fallacy is not represented in the Wheel of Reasons: the Wheel only sets forth all possible relations of the 'middle' to the 'major,' and does not concern itself with the relation of the 'middle' to the 'minor'.

19 Dr. Faddegon, *op. cit.*, p. 108, remarks: "The translation of *ākāsa* by 'ether' is very misleading. It has nothing in common either with the Greek notion of αἰθήρ or with the notion of ether as conceived by modern European physics. It is space as the medium through which sound is transmitted. I have called it 'physical space' in order to distinguish it from *dik*, *i.e.*, space regarded with reference to direction, termed by me 'mathematical space'." (*Dik* is the root found in Greek δείκνυμι. *Ākāsa*, etymologically, would indicate brightness or light. Philosophically, its function is to be the medium of sound, and the subtle stuff of which the inner organ of hearing is composed.)

20 The trick of the *purely negative* pseudo-paradeigma is a fallacy of many questions. Your opponent maintains that there is no such thing as a soul. "Well then," runs the retort, "of course you will agree that inanimate things are soul-less?" The opponent (it is supposed) feels himself compelled *a fortiori* into this admission, having maintained the more comprehensive position that everything is soul-less. The admission provides you with the negative example free from enstasis which you consider *in this particular type* sufficient for proof. As a matter of fact your argument will involve an illicit process of the major:

Inanimate things are soul-less
The living organism is not inanimate
Therefore the living organism is not soul-less

(The seventh century commentary *Nyāya-vārttika* states the argument in this form – *Bibliotheca Indica* edition, p. 126, l. 6. Later commentators 'convert' the major premise. The author of the *Vārttika* is of course aware of the objection to which his form of argument is exposed – that "it does not establish exclusion of soullessness in the living organism". His reply takes the form of an *argumentum ad hominem* – the objector must beg the question if he tries to adduce an instance in which the exclusion of absence of vital functions does *not* exclude the absence of soul – for he can only adduce the living organism itself.)

It is impossible to get over this difficulty without begging the question openly: for to convert the major into the required form "All soulless entities are inanimate" is to deny *ab initio* the opponent's position that some soulless entities are animate, *viz.*, the living organism.

But the question has been begged already in presenting the opponent with a dichotomy into soulless and soul-endowed things, which is implied in asking him to admit that inanimate things are soulless. The prior question is whether the dichotomy within which the opponent is asked to make affirmation or denial is a universe of reasonable discourse at all. From the opponent's point of view it is not – and therefore he need neither affirm nor deny.

21 Some schools admitted the existence of inferential processes other than "syllogism" (*anumāna*). One such process is *Arthāpatti*, which English translations render either by 'Presumption' or by 'Implication'. The Stock example of this is: "Devadatta, who is fat, does not eat by day: *ergo*, he eats by night." (Bosanquet too would have called this 'implication'.) The nerve of the process is that the facts (*artha* = thing) force some presumption upon the mind. It is thus that you know, for example, that there is a potency in the seed which makes it grow. The orthodox school reduces *arthāpatti* to the 'purely negative' type of syllogism.

22 I think I remember the late Prof. Cook Wilson referring to 'the science of SMP' as a branch of mathematics.

23 No less relational, and no more syllogistic, is the quite different type of argument from relations of identity, such as that which is sometimes adduced as a case in which the 'syllogism' plainly functions in the discovery of a new truth, – the case of the priest who has just said that his first confession was that of a murder – whereupon X enters the room and greets the priest with the remark that *he*, X, was the first person to make a confession to the priest. A is B. B is C. *Ergo*, A is C–X is a murderer. A good inference, but not assuredly a subsumption in any sense: having neither a universal premise stating a principle from which the conclusion is deduced; nor yet any 'example' adducible of universal connection between being the first person to make a confession to this priest, and being a murderer. It is a purely relational argument, the relation being that of numerical identity. I can see no excuse at all for calling such an argument syllogistic, except the accident that it happens not to involve the *quaternio terminorum*, which is obvious in arguments like A is to the right of B, and B to the right of C.

I suppose the orthodox Indian logician would have treated this argument from identity as belonging to the 'purely negative' type of syllogism:

"X is a murderer,
Because he is the first person who made a confession to Y,
Those who were *not* guilty of this murder did *not* make the first confession to Y – like Z etc."

And other relational arguments could be similarly treated – or maltreated. For this Type, as noted above, is a department of syllogism roomy enough to hold the whole of mathematics.

We get over the difficulty, in the case of the argument from identity, by treating singular propositions as equivalent to universals a sufficiently uncritical procedure. We do not get over it at all in the case of the other relational arguments which involve *quaternio terminorum*: for attempts to construct a major stating the principle of the inference, whilst crowding all the data into a congested minor, may be disregarded as a confessed failure.

24 The slight acquaintance which I have with the later developments of Indian logic perhaps justifies the statement that the formalism which Indian logic *did* develop is a far more terrible affair than anything the

Western schools can boast of. It consists (externally at least) in the introduction, into definitions, of an almost incredible verbal complexity, in the form of compounds which are, quite literally, *sesquipedalia verba*. The acquiring of the habit of mind necessary for the unravelling of these syntax-less word-masses is a discipline of years, and one which I do not hope to undergo This type of scholasticism commences with the twelfth century and flourishes to-day in the schools of indigenous culture.

25 See footnote 21.

26 The larger question is whether the universal always functions in inference in the way in which the syllogism represents it as functioning. The doctrine of syllogism, as universal type of inference, is that the universal acts always as an explicitly apprehended *unit* in the inference – it is a Member or Premise of the reasoning. There is in the mind a vast reticulation of concepts or points of view, *vyāpti's* (whether or not these are regarded as derived from prior concrete experiences); and syllogism is the process through which the special case is caught in the meshes of this net of abstractions the logical ideal of reasoned truth being satisfied only if the universal is explicitly apprehended and formulated in abstraction from the particular embodiment of it to which the reasoning 'applies' it. That the universal sometimes functions in this way must be admitted. That it always does so seems to be an illusion of the schools.

Chapter 4

Studies in Indian Logic

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1 THE INDIAN AND THE ARISTOTELIAN SYLLOGISM

Most of the authors who study the problems of Nyāya philosophy believe that they can maintain a more or less close structural relation between the Indian and the Aristotelian syllogisms. One of the exceptions is the competent researcher P. Masson Oursel.[1] Radhakrishnan[2] says, 'the Naiyāyika regarded Barbara as typical of all syllogistic reasoning'. Stcherbatsky[3] judged in a similar way: 'in the last three (members), if we drop the example, we will have a strictly Aristotelian syllogism, its first figure'.[4] In this paper I want to show briefly why this view is to be rejected.

1. The right theoretical understanding of the Aristotelian syllogism is a precondition for the question whether the Indian and the Aristotelian syllogism are similar or different. However, we will not find this understanding in the textbooks of 'philosophical' logic, like Erdmann's or Sigwart's. The real nature of the Aristotelian syllogistic remained more or less unknown to philosophers until very recently: contrary to Kant's statement it is not a complete theory but merely a fragment, namely the ancient form of the modern nominal calculus; empty and individual names (like the 'mortal Socrates') may not be substituted for the variables S, M, and P; finally, the real syllogism as formulated by Aristotle in the *Prior Analytics* (I, 4) does not consist of three but of one proposition in which the implication of two relations of inclusion, SaM and MaP on the one hand, and of the relation of inclusion SaP on the other hand, is stated. It took modern mathematical logic (logicism) to create the 'reliable position' from

which not only Aristotle's achievement but the whole history of European and Oriental logic could be critically appreciated and evaluated.[5] The comparison between Nyāya and the *organon* could contribute to a better understanding of the problems of Indian logic. However, one ought to use the authentic Aristotle, as first shown and taught by J. Łukasiewicz, not the traditional interpretation that rests on misunderstandings.[6]

2. Once this condition is fulfilled, a number of fundamental antitheses between the real Barbara mode and the Indian paradigm will emerge.

(a) The Indian syllogism is not a logical theorem but a combination of two rules of inference: the *upanaya* ['application'] and the *nigamana* ['conclusion']. The rule *upanaya* is equivalent to the modern rule of substitution and allows, in the general law *'yatra yatra dhūmas, tatra tatra vahniḥ'* ['wherever there is smoke, there is fire'], for the indefinite *yatra yatra* to be replaced by the concrete value – the *pakṣa* – 'this mountain here'. In this manner we move from the proposition $(x).\ \varphi x \supset \psi x$ = 'for all x, if there is smoke in x then there is fire in x', to $\varphi a \supset \psi a$ = 'if there is smoke in a then there is fire in a'. This transitional formula is not made explicit in the Indian example because Indian logic is not concerned with the completeness of a proof; nevertheless, the words *tathā cāyam* ['This is thus.'] hint at this step with sufficient clarity. The rule of *nigamana* is equivalent to the modern rule of separation and allows us to separate the established *hetu* ['reason'] = φa from the implication $\varphi a \supset \psi a$, which we arrived at by *upanaya*, and to state that the *sādhya* ['thesis-to-be-inferred'] = ψa is true.

The difference between a logical theorem and a logical rule of inference is of fundamental significance.[7] If one wants to ignore this difference in order to summarise the whole Indian syllogism in one thesis, one gets a statement which is known from Russell's 'theory of apparent variables': $(x)\ \varphi x \supset \psi x : \varphi a \supset \psi a$ = 'if for all values of the variable x the propositional function φ implies the propositional function ψ, then the propositional function φ also implies the propositional function ψ for the value $x = a$'.

(b) We gain important clues for the exact interpretation of Indian terminology from this analysis. *pakṣa* is the variable for a name, a, which is substituted for x in φx and ψx. A precondition for this operation is the *pakṣadharmatā = hetoḥ pakṣavṛttitvaṃ* which means 'the occurrence of the *hetu* in the *pakṣa*'. Translated into our symbolism this means that a, 'this mountain here', is the variable of

the same propositional function φ which appears in the implication $\varphi x \supset \psi x$ as the implicans φx. *hetu* is the proposition φa which is recognised as being true, *sādhya* is the inferred ψa which we gain by *nigamana*. From this it emerges clearly that the three elements of the Indian proof, *hetu*, *pakṣa*, and *sādhya* are not identical with the three terms of the Aristotelian syllogism.

(c) The Aristotelian syllogism is built out of propositions, and only those propositions, of the form SaP, SeP, SiP, and SoP. The Indian syllogism is not at all restricted to this form of expression. In addition to the formulation *'yo yo dhūmavān, so so vahnimān'* ['whatever possesses smoke, possesses fire'], the texts make frequent use of the formulation *'yatra yatra dhūmas, tatra vahniḥ'* [wherever there is smoke, there is fire]. These two variants are not at all equivalent in a logical or formal way because in one of them the word *asti*, which is to be supplemented, is the copula, while in the other it has the sense of the verb 'exists'. The structure of the sentence *'yatra, yatra....'* rules out an unforced reduction to any form of either the real Aristotelian or the 'traditional' syllogism.

(d) The following difference is important: in the Aristotelian syllogism the three terms S, M, and P are general names or, according to a different interpretation, they are names of classes. At any rate they are not individual names.[8] In contrast with this, in the Indian syllogism an individual like 'this mountain here' may appear as the subject of the argument (as *pakṣa*). Dignāga, however, added a restriction, the meaning of which is not quite clear, according to which the individual has to belong to a class.[9] There are then cases in which the *sādhya* can be represented as 'SεP' = 'S is an element of class P'. This would correspond to the 'traditional' inference with the *terminus discretus sive singularis* [separate or singular term]. According to the authentic Aristotelian syllogistic, however, the formulations 'SεP' and 'SaP' are by no means equivalent.[10] There have been some attempts in later European logic at interpreting individual names as names of classes, i.e. as names of classes with only one element. We cannot use this view for the interpretation of the Indian syllogistic, the main reason being that Indian philosophers themselves reject this view explicitly. Among the six reasons in the well-known verse from the *Kiraṇāvalī* by which Udayana rules out the notion of a class (*jātibādhaka*) the first is 'uniqueness of the individual' (*vyakter abhedaḥ*): the cosmic ether only exists as one specimen and therefore it does not have a *jāti*.[11]

3. In summary, under no circumstances can we force the Indian syllogistic onto the Procrustean bed of the authentic Aristotelian

syllogistic. Likewise, only with great difficulties can we view it through the grid of the 'traditional' syllogistic. We can only do justice to the meaning and possible developments of the Indian syllogistic by seeing it as a prescientific anticipation of some forms of inference which we know from modern logic (e.g. Russell's 'theory of apparent variables' or Hilbert's 'narrower functional calculus'). Indology has to rid itself from the false suggestion that the Aristotelian or the traditional syllogistic provide a suitable basis for the interpretation of the problems of Nyāya philosophy.

2 ANCIENT INDIAN ANTICIPATIONS OF PROPOSITIONAL LOGIC

Among the most important findings which we owe to modern scientific logic is the distinction between nominal and propositional calculus. What I mean by this should be clear even to the layman: in nominal calculus only names, in propositional calculus only propositions, can be substituted as values for variables. Both branches of logic are represented in Greek philosophy. We recognise at first glance the nominal calculus in the Aristotelian syllogistic. And the idea that Stoic dialectics represents an ancient form of the propositional calculus is one of the best discoveries for which we are indebted to J. Łukasiewicz. It is obvious that the foundations for a critical history of Western logic were laid by this clarification alone. Unfortunately, the well-known work by Prantl does not deserve this name any more. For the indologist, who is interested in the same problems in the Indian context, the question arises whether there are fragments of a propositional theory in Nyāya literature. It is very unlikely that we will find a logical theory in India which is of equal value with the Chrysippian dialectic; firstly, because the Indians never reached the level of Hellenistic logic; secondly, because the distinction between 'propositions' and 'names' in particular is made difficult not only by the 'nominal style' of Indian languages but also by the possibility of expressing every proposition by abstraction through *-tva* and *-tā*.[12] However, the beginnings and prescientific anticipations of a propositional logic can be found in India. In what follows I want to discuss some examples of this kind.

1. The oldest Indian text which hints at the knowledge of some theorems of propositional calculus is the *Kathāvatthu*. This tract discusses heretical theses according to a stereotypical schema, which had been rendered by Shwe Zang Aung[13] as follows: 'if A is B, then C is

D; but C is not D; therefore A is not B'. As one can see, this formula is equivalent to the Stoic *modus tollendo tollens*. However, Shwe Zang Aung does not say this and he wrongly suggests that we are dealing with the relation between the four terms A, B, C, and D by the unnecessary introduction of nominal variables. In fact, the elements with which the logic in the *Kathāvatthu* operates are evidently not nominal variables but propositional variables which means that the whole discussion proceeds according to the following schema:

Theravādin: Is it true that p?
Opponent: It is true. $[\vdash p]$.
Theravādin: Is it true that q?
Opponent: It is not true $[\sim q]$.
Theravādin: admit the refutation.
(1) if it is true that p, then it is true that q $[p \supset q]$,
(2) the assertion that p is true but q is not true, is not true $[\sim(p\ \sim q)]$,
(3) if it is not true that q, then it is not true that p $[\sim q \supset \sim p]$,
(4) the assertion that p is true but q is not true, is not true $[\sim(p\ \sim q)]$.

The author of the *Kvu* rests content with those four statements and thinks it is superfluous to develop the complete proof *modo tollente*: $p \supset q\ \ \sim q \supset \sim p$. In the same way he does not say explicitly, although he had this undoubtedly in mind, that the following theses are to be regarded as equivalent: $p \supset q$, $\sim(p . \sim q)$, and $\sim q \supset \sim p$. The equivalence: $p \supset q\ \equiv . \sim(p . \sim q)$ is well known to logicians as the 'definition of implication'. The equivalence: $p \supset q . \equiv . \sim q \supset \sim p$ is the important law of transposition. I believe that it is very likely that the author of the *Kvu* knew about these two laws.

2. Additionally, Buddhaghoṣa's commentary contains interesting details for our topic. Buddhaghoṣa calls the conclusion from the premise $p \supset q$ 'direct' (*anuloma*) and the conclusion from the premise $\sim q \supset \sim p$ 'inverse' (*paṭiloma*). Buddhaghoṣa paraphrases the 'direct' schema in the following way: 'since for you in the place of the first acknowledged thesis the second thesis is not acknowledged; the not acknowledged second thesis, however, cannot be combined with (*na saṃdhīyate*) the first (acknowledged thesis); for this reason, after making such a mistake, you have to admit this'. *na saṃdhīyate* here can only mean logical incompatibility (inconsistency). Buddhaghoṣa's explanation can be traced back to the theorem, which amounts to the following formula: $p \,/ \sim q\ \ \sim q . \supset . \sim p$ = 'if p and $\sim q$ are incompatible

and if q is not true then p is not true'. It has to be pointed out that, in the commentary, the establishment of the incompatibility is supposed to describe the theses $p \supset q$, $\sim q \supset \sim p$, and $\sim(p. \sim q)$ of the original text. This shows that Buddhaghoṣa knew that the three theses 'p is incompatible with $\sim q$', 'if p then q', and 'it is not true that p and $\sim q$' are equivalent.

Additionally, Buddhaghoṣa's explanation contains some terminological remarks which show the apagogical and hypothetical character of the *Kvu's* logic. p = *ṭhāpanā* is the opposing thesis, which is assumed to be the apodosis of a condition by a Theravādin. This sentence which is only admitted hypothetically implies the consequent q = *pāpanā* which is not acceptable for the opponent. Once this unacceptability is established the 'imposition' (*āropanā*) of the rejection according to the *modus tollendo tollens* or an equivalent formulation follows.

3. The apagogical syllogism which deduces consequences from the opponent's thesis, shows that these consequences are false and then concludes that the thesis itself is false, is the normal instrument of scientific discussion (*vāda*). In the era of scholastic synthesis this type of indirect proof was called *tarka*. However, it was explicitly mentioned that the idea of *tarka* was not only negative criticism (*vitaṇḍā, dūṣaṇa*) of the opponent but the positive justification for one's own thesis. In principle this is only possible if one recognises the possibility of deducing the thesis 'it is true that S is not P' from the thesis 'it is not true that S is P'. This problem was the cause of an interesting debate in India.

This debate derived from an objection by the Mādhyamikas against the method of indirect proof. The only absolute norm of cognition is mystical intuition in which the saint realises the non-reality of everything that seems to exist distinctly (*sarva-bhāva-svabhāva-śūnyatā*). Discursive thought is by definition flawed and misguided (*vikalpa = avidyā*). This rejection of realist logic, however, does not exclude the possibility of a purely negative dialectic which reduces every thesis *ad absurdum* and which liberates the spirit from the make-belief of conceptional construction. This dialectic rejects the transition from $\sim(S \text{ is } P)$ to $(S \text{ is } \sim P)$ because it rejects the idea that any subject which could be predicated possesses reality. One cannot say about the son of a barren woman whether he is black or not black. Since, according to the Mādhyamikas, every object is non-real just like 'the son of a barren woman', all thought and judgement goes back to the fourfold negation (*catuṣkoṭi*): $\sim p$ and $\sim(\sim p)$ and $\sim(p.\sim p)$ and

$\sim[\sim p.\sim(\sim p)]$. This means that only negative propositions of the form 'it is not true that T', which only negate the thesis T without thereby asserting the truth of the antithesis $\sim T$, are true. The Mādhyamikas emphasise strongly these idiosyncrasies of a negative dialectic.[14] This is the main difference between the meta-logic of the Mādhyamikas and the method of *tarka*.

4. In part, the theory of purely negative sentences has its own terminology. The thesis which is extraneous to the theory and which the dialectician assumes hypothetically is called *prasaṅga-vākya* meaning 'statement of eventuality'. The proof of the falsity of the foreign thesis by reduction to an 'undesirable consequence' is called 'proof of eventuality' = *prasaṅga-sādhana*. It is clear that this whole proof runs according to the *modus tollendo tollens*.

The consequence of a 'statement of eventuality', which is undesirable for the opponent, need not be a logical absurdity. Rather it can be a sensible thesis which the opponent cannot accept for some reason. There is a special case in Indian dialectic which is called *atiprasaṅga* = 'hyper-eventuality' and whose 'undesirable consequence' rests on the fact that it is identical with the 'possibility of everything' (*sarva-saṃbhava*). The formal structure of these syllogisms is not quite clear. One might, however, think of an anticipation of the 'characteristic of falsehood' which was already known in the Christian world in the middle ages. This had the following formula: if p and $\sim p$ then if p then $q[p \ \sim p :\supset p \supset q]$. This means that any statement follows from two contradictory statements. Another less interesting interpretation which I want to mention briefly is however possible:[15] there is a 'limiting condition' N (*niyāmaka*), according to which $\phi(x)$ only yields a true sentence for some x. Now we state a thesis T which implies that $\phi(x)$ yields a true sentence even for those x which do not satisfy N. From the two premises: 1) $\phi(x)$ applies only to those x which satisfy N and 2) $\phi(x)$ applies also to those x which do not satisfy N, there follows the 'undesirable consequence' of *atiprasaṅga*, i.e the *sarva-saṃbhava – sarveṣāṃ, sarvatra, sarvadā saṃbhava* – the thesis that $\phi(x)$ is true for every x always and everywhere. Stcherbatsky (*Nirvāṇa*, p. 235) explains the notion *atiprasaṅga* as 'a generalised *deductio* (sic!) *ad absurdum*', in *Buddhist Logic* (II, p. 239) 'as giving up every uniformity' and as 'possibility of everything'; Sylvain Levi (*La Trentaine*, p. 66) as 'faute de raisonnement par depassement d'extension'; H. Jacobi (*Triṃśikavijñapti*, p. 6) translates: 'otherwise everything would be possible'. The problem of *atiprasaṅga* deserves to be studied in more detail.

Not all Buddhists were such radical opponents to *tarka* as were the Mādhyamikas. That means that not all of them subscribed to the doctrine of absolute and universal 'nonpredicability' (*avācyatā, anirvacanīyatva*). This has to do with their fundamental metaphysical beliefs.

It is well known that the Sarvāstivādins and the Theravādins postulate the existence of simple, elementary substances, the *dharmas*, which manifest themselves in individual moments of reality, thereby creating the empirical illusion of the world of objects and persons. The *dharmas* as real substances can be predicated. That means they possess their *svalakṣaṇas*, their individual essences; or according to the 'dynamical' interpretation of substances of the Sautrāntikas they possess their individual momentary 'way of affecting', their definable *artha-kriyā-kāritva*. Illusory, non-real objects, false hypostases like for example 'the world', 'the soul' etc. cannot however be predicated. In this manner the paradox of the 'non-revealed points' (*avyākṛta-vastu*) is overcome.

The Pudgalavādins view the issue differently. They state that in addition to the *dharmas*, which can be predicated, there is a real 'I' which cannot however be predicated. This is the *pudgala*. It is a being which is *sui generis* transcendent. Although it manifests itself in correlation with the psycho-physical elements (*skandha*) it cannot be determined in principal with regard to its identity with and difference from these elements.

This doctrine of simultaneous reality and non-predicability of the *pudgala* is attacked by all other schools of Buddhism. Kamalaśīla's commentary to the *Tattvasaṃgraha*, the *Pañjikā*, is no exception.[16] The criticism of Kamalaśīla is worth noting because it clearly shows the formal background of the debate: the reducibility of propositional negation to predicate negation. Kamalaśīla thinks along the following lines: if the *pudgala* is a real object, then the negation 'the *pudgala* is identical = not different from the *skandhas*' has to imply the affirmation 'the *pudgala* is not identical = different from the *skandhas*'. This last thesis, however, is a positive statement about the *pudgala*; so if the *pudgala* is a real object it cannot be impossible to predicate it. Also if it is not possible to predicate the *pudgala*, i.e. if it is neither identical with the *skandhas* nor different from them, then the *pudgala* cannot be an object[17] but it can only be fiction like the hare's horn or the son of a barren woman.

The insight that the reliability of the transition from propositional negation to predicate negation depends on the reality of the subject is

an important logical discovery. The same problem used to occupy the ancient Greeks. Aristotle (*Prior Analytics*, I, 40) discusses whether the terms τὸ μὴ εἶναι τοδί ['being not this'] and εἶναι μὴ τοῦτο ['not being this'] have the same meaning. Stoic logic also noted the ambiguity of negation. What role this problem plays in modern logic can be seen in Kontarbinski, *Elemente der Erkenntnistheorie, der formalen Logik und der Methodologie der Wissenschaften*, p. 223, p. 231 and following. It is typical that for Indian thought this logical question was raised and answered in connection with metaphysical problems. The relation between logic and metaphysics was as intimate in India as in ancient Greece.

NOTES

1 See *La Philosophie Comparée*, p. 132.
2 *Indian Philosophy*, II, p. 83.
3 *Buddhist Logic*, I, p. 26.
4 See also Athalye, *Tarka-Saṅgraha*, p. 236 and following and p. 265 and following. Also Vdyābhūṣaṇa, *History of Indian Logic*, p. 497 and following.
5 See H. Scholz, *Die Geschichte der Logik*, 1931.
6 See his *Elementy logiki matematycznej*, Warszawa, 1929, p. 15 and following.
7 See Łukasiewicz, *op. cit.*, p. 19 and following. Also Carnap, *Abriss der Logistik*, p. 10 and following.
8 See J. Łukasiewicz, *op. cit.*, p. 23.
9 See G. Tucci, *The Nyāyamukha*, p. 7.
10 See H. Scholz, *op. cit.*, p. 39, 68.
11 See *Muktāvalī*, ed. Haridas Sanskrit Granthamala, p. 8; Strauss, p. 6; Athalye, p. 92.
12 *śabdasya nityatvaṃ* could easily be regarded as the 'name' of an 'ideal object', 'the eternity of a sound'; however it is equivalent to the 'statement': 'it is a fact that...'
13 See his *Points of Controversy*, p. XLVIII.
14 See *Vigrahavyāvartanī*, verse 30, *Prasannapadā*, pp. 13, 16 etc.
15 My remarks in *Sprawczdania* XXXVIII, 2, p. 21 are to be added to this.
16 See my translation in *Rocznik Orjentalistyczny*, VIII, pp. 78–93.
17 'Something which cannot be predicated, cannot be real', this is also Candrakīrti's view. See *Madhyamakāvatāra*, p. 269: *brjod-du-med-pa-la rdzas-su yod-pa-ñid mi-srid-pa.*

Chapter 5

On the Method of Research into Nyāya

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A number of older and younger researchers are currently taking part in research on the history of Indian logic. It is thanks to them that today we begin to have an overview over historical connections. Also, they have made us appreciate the individual achievements of Indian thinkers, in particular those of the Buddhist masters Vasubandhu, Asaṅga, Diṅnāga, and Dharmakīrti. Chinese and Tibetan translations have been made available and new light has been shed on the much discussed question about the relation between Buddhist and Brahminical logic.[1] Unfortunately, there is no correlation between the new philological-historical knowledge and a deeper theoretical understanding. We do not have a satisfactory account of Indian syllogistics, and what can be found about them in the literature is partly unclear and vague and partly false and misleading. There is no doubt about the causes of this predicament. They have to do with the fact that those indologists who have written about formal-logical aspects of Nyāya so far are not familiar with European logic. Even Stcherbatsky's works are not free from this charge. When one looks at the name index of the monumental *Buddhist Logic*, one has to admire his breadth of knowledge. This is rare among indologists. At the same time, however, it is striking that he cites only philosophers as examples of Western logic. This 'philosophical' logic which was carried out by Erdmann, Lotze, Cohen, and Sigwart among others cannot possibly be seen today as a suitable basis for a critical appraisal of the Indian Nyāya-school. For more than 50 years now there has been a strict scientific logic which really deserves its name; it is the symbolic (mathematical) logic which was anticipated by Leibniz, prepared for by Boole and

Schröder, and founded by Frege and Russell.[2] Without knowledge of the elements of this logic, historical research into Indian logic is unthinkable; this is for the same reasons that the history of Indian mathematics is unthinkable without a positive knowledge of modern mathematics and the history of Indian linguistics is unthinkable without positive knowledge of modern linguistics. The remaining merits of older researchers like Athalye, Jacobi, and Suali among others for research into Nyāya are above all criticism and I am far from claiming that their achievements are wrong or worthless. However, every generation has to solve its own tasks; now that the great philologists, through hard work and scholarly effort, have made the sources of the history of Indian formal logic available and made a first orientation possible, it is time to approach the Nyāya texts with logical, not just with philological or philosophical competence.[3]

The justification of this postulate is the main objective of the following lines.

In order to rule out possible misunderstandings right from the beginning, I would like to make it clear in what way and to what extent knowledge of symbolic logic contributes to a deeper and better understanding of the Indian syllogistic. First, I would like to emphasise that among all the problems that the Nyāyaśāstra deals with[4] only the doctrine of *anumāna* belongs to logic in the modern sense. The other elements of the doctrine, the *pramāṇa* theory, the analysis of *pratyakṣa*, the *jāti* and *sāmānya* problem, the question about the relation between word and object, belong partly to psychology, partly to epistemology and metaphysics, and partly to semantics. Formal logic does not have anything to do with these problems directly and leaves them to philosophers. However, even the *anumāna* doctrine with its important distinction between *svārtha-anumāna* as the process of thinking and *parārtha-anumāna* as the linguistically formulated conclusion 'for others' is not as separate from epistemological and psychological speculation, as logic demands. This is so because the interest of Indian authors in the problems of syllogistic is not formal-logical. The task is to gain true conclusions from true premises and that is why the *prasiddhatva* ['explanation', 'clarification'] of the *pratijñā* ['thesis'] is the obvious precondition of the Indian syllogistic. It is mandatory that the syllogism contains the required minimum in order to make the listener see its correctness. For the unlearned[5] all three elements, *pakṣa*, *hetu*, and *dṛṣṭānta* have to be mentioned; for the learned the *hetu* is sufficient. The logical completeness of the proof is not important for Indian logicians. And the fact that it is possible to discuss purely

structural relations between formulae and variables without mentioning the truth and falsehood of statements, which are derived from these formulae by inserting values for variables, was not clear to Indian authors, as far as we know now, even in the period of final synthesis.

Another difficulty for a strictly formal treatment of *anumāna* theory is that Indian logic does not state its laws in a symbolic language but either in paraphrases with *yo, yatra, vidhi, vacana, artha, vastu* etc. or in examples. Both means of expression have the disadvantage in comparison with Aristotle's applied symbolism of letters that they do not show the structure of logical laws clearly and leave room for different interpretations. When Nāgārjuna (*Kārikā*, XIV, 5b) says: *yat-pratītya ca yat, tasmād anyanopapadyate* = that which depends on something cannot be different with relation to that (on which it depends), he means what can be said in the transparent formula: $(x,y)\ xRy \supset . \sim(x \neq y)$ = for all values of the variables x and y, if x stands in relation with y then it is false that x and y are not identical. Clear formulations like these are, however, an exception. It is enough to translate verses 340–342 of the *Tattvasaṃgraha*[6] in order to realise how complicated and ambiguous the method of 'paraphrasing' is. The ambiguity of examples is of a different kind. For the Aristotelian syllogism it seems that it does not matter in principle whether to say '*τὸ A παντὶ τῷ B ὑπάρχει*' or 'all humans are mortal'. That seems to be right as long as we know what in the statement 'all humans are mortal' is to be taken as constant and what is to be taken as variable. The formula '*τὸ A παντὶ τῷ B ὑπάρχει*' teaches us that there is a relation of inclusion between the classes A and B and that is why we know that in the sentence 'all humans are mortal', 'humans' and 'mortal' are variables. In the Indian syllogistic it is not clear and not easy to discern by philosophical means whether in the example of fire on the mountain the variables are mountain, smoke, and fire or the statements 'somewhere there is smoke', 'somewhere there is fire', and 'there is smoke on the mountain'. The Indian authors are of no help here because they mention the possibility[7] of different interpretations and generally they do not distinguish between the object and a statement about the object.

Summing up what has been said so far, it is clear that we cannot presuppose the same level of abstract thought in India as in Greece. The treatment of formal-logical problems in Nyāya texts never went beyond the prescientific stage and no Indian theory can be expressed – in contrast with the Aristotelian syllogistic[8] – in strictly formal terms as an independent system or as a fragment of a different, more encompassing system.

Having answered the question what not to expect from knowledge of modern logic for research into Nyāya, we now have to define the positive value of this knowledge. In short, this is (i) that we liberate ourselves from the false suggestions of traditional philosophical logic and (ii) that we gain an objective, strictly scientific measure for a critical appreciation of the Indian achievements.

Regarding the first point, I would like to remark that according to Kant's famous dictum in the preface to the second edition of the *Critique*, traditional logic is a discipline, which 'until now has not been able to progress and so seems closed and complete'. According to a well-known logician and scholar of ancient logic[9] this is testimony to the authority of the author of the *organon* but also to the low level of formal-logical knowledge of modern philosophers. Indeed, what Kant and his successors understood to be Aristotelian logic is simply a misrepresented pseudo-Aristotle.[10] It remained unknown to the best scholars of the history of logic, including Prantl, that (i) the real syllogism consists of a conditional and not of two premises which are linked with the conclusion through 'therefore',[11] that (ii) in the real syllogism a universal name and not an individual name 'Socrates' has to be substituted for the subject,[12] and that (iii) Aristotelian logic is not a universal and complete theory but – without questioning its historical value – a meagre fragment. Under these circumstances it is no surprise that indologists saw in the traditionally misunderstood syllogistic the only basis for the interpretation of Indian problems of Nyāya, that they equated the expressions *pakṣa*, *hetu*, and *sādhya* with *terminus minor*, *medius*, and *major*, and that they regarded the whole Indian syllogism as a stylistic variant of the Barbara mode.

Modern logic dispenses with these mistakes and misunderstandings. It shows the versatility of logical systems and draws our attention to problems in Indian texts which were either missed by the cleverest of scholars or recognised by them but not really understood. In order to make discoveries in any field, one has to know which possibilities exist in advance. If one only knows the Aristotelian syllogistic in its traditional form, one will regard the whole of the Indian tradition as nothing but an analogy of Aristotle. Knowledge of modern logic broadens the horizon. It becomes clear that Indian texts anticipate a number of theses which do not have any connection with Aristotle, but which anticipate Stoic[13] dialectic and propositional calculus. Critical appreciation of this intuitive anticipation is an important preliminary work for a general history of logic.

This touches on the second point of our answer. Logic is an exact and specialised discipline and demands that its history be measured more objectively and be represented as the history of discoveries and positive progress. In this it resembles its sister-discipline mathematics. In order to critically appreciate the achievements of Indian authors as anticipations of scientific logic, the indologist needs 'a reliable point of reference' with regard to which the history of Indian theories can be seen and from which this history can be viewed. The fact that this 'reliable point of reference' can only be found in modern symbolic or mathematical logic is impossible to doubt these days. Deussen's[14] postulate, which he made with reference to Aristotle (*De Coelo*, I, 10), that the historian of philosophy ought to be referee rather than player is impossible to satisfy. The historian of logic may be a διαιτητής, however, if he is familiar enough with logic.

It is best shown by a concrete example what, from the knowledge of modern logic, is useful for research into Nyāya. That is why in the final part I will give a formal-logical analysis of the 'smoking hill' example.[15]

As said before it is not easy to decide whether the Indian authors regarded the elements of the syllogism as names or propositions. If one wants to attempt to solve this question one has first to clarify what the Indian syllogism really is, i.e. how to understand it from the standpoint of modern logic. This question is answerable without difficulty. If we do not pay attention to the quite significant difference between the two formulations: *yo yo dhūmavān, so 'gnimān* [whatever possesses smoke possesses fire] and *yatra yatra dhūmas, tatra tatrā 'gniḥ* [wherever there is smoke, there is fire] and if we only look at the latter then we can represent the example in the following way:

1) *pratijñā*	ψa	There is fire on a (= on this mountain)
2) *hetu*	φa	There is smoke on a (= on this mountain).
3) Statement of *vyāpti*	$(x)\,\varphi x \supset \psi x$	For every locus x: if there is smoke in x then there is fire in x.
4) *upanaya* = statement of the *pakṣadharmatā*	$\varphi a \supset \psi a$	This rule also applies to $x = a$ (for the *pakṣa*).
5) *nigamana* = statement of the *sādhya*	ψa	Because the rule applies to $x = a$ and the statement φa is true, the statement ψa is true.

Expressing this proof correctly in the form of a conditional we get the following theorem which is well known from Russell's 'theory of apparent variables': $(x).\varphi x \supset \psi x : \varphi a : . \supset \psi a$ = if for all values of the variable x the function φ implies function ψ, then the proposition φa implies ψa. In our example φ = there is smoke on ..., ψ = there is fire on..., and a = this mountain. This contains clear hints for a critical interpretation of the Indian expressions; *upanaya* (= statement of the *pakṣadharmatā*) is the rule of substitution which allows us to insert the concrete value – the *pakṣa* = this mountain – into the general law *yatra yatra dhūmas, tatra tatrā 'gniḥ* in place of the unspecified *yatra yatra*. The proposition $\varphi a \supset \psi a$ which is gained by this operation is not explicitly stated in the Indian syllogism because Indian logic does not emphasise the completeness of a proof. However, the words *tathā cāyam* ['This is thus.'] hint at this step clearly enough. The rule of *nigamana* is equivalent to the modern rule of separation[16] and allows us to leave out the *hetu* = φa, which was recognised as being true, from the implication $\varphi a \supset \psi a$, which we gained through *upanaya*; it also allows us to state the truth of the *sādhya* = φa. *hetu* and *sādhya* are statements, *pakṣa* is a variable for a name (a, which is substituted for x in φx and ψx). *pakṣadharmatā* = *hetoḥ pakṣavṛttitvaṃ* = the fact that a = this mountain is the variable of the same formula φ which appears in the conditional $\varphi x \supset \psi x$ as the antecedent.

From this analysis we gain important ideas for answering the question of the relation between the Indian and the Aristotelian syllogism. Bearing in mind what I said earlier about the authentic Aristotelian syllogism we gain the following list of basic antitheses.

The Aristotelian syllogism	*The Indian syllogism*
(1) is a logical theorem which is formulated as a conditional;	(1) is a combination of rules of inference;
(2) is built only from statements of the form SaP, SeP, SiP, and SoP	(2) is built from statements in which *asti* ['is'] is to be added sometimes as a copula and sometimes in the sense of the predicate 'exists';[17]
(3) is based on the implication between two subsumptions: SaM and MaP on the one hand and SaP on the other hand = SaM. MaP. ⊃. SaP;	(3) is based on the implication between two statements: $\varphi x \supset \psi x$ and φa on the one hand and the statement ψa on the other hand = $(x).\varphi x \supset \psi x : \varphi a : \supset \psi a$;
(4) the variables S, M, and P must not be individual names	(4) the variable a may be (in Buddhist logic it has to be) an individual name[18]

These differences which I mentioned are all equally important in the formal-logical sense. However, the third deserves to be emphasised because it demonstrates *ad oculos* that *pakṣa*, *hetu*, and *sādhya* are not to be identified with the three terms of the Aristotelian syllogism. In the Indian example there is no such thing as the relation of subsumption[19] and the attempt to represent the inference with the help of Euler's circles has to be rejected. If Athalye[20], Vidyābhūṣaṇa[21], and Stcherbatsky[22] thought that the Indian syllogism can be traced back to the Barbara mode then this is a misunderstanding which ought to disappear from indological literature.

I am going to close with some remarks on the notion of 'anticipation'. 'To anticipate' means 'to take before' or 'to pre-form' and one has to stick to this meaning The Indian syllogistic is a 'pre-formation' of some forms of inference which we know from modern logic. It is not an 'analogy' because this would presuppose a similarity or at least a comparability of the level of historical development which does not exist. We do not compare Indian and modern logic in order to find individual differences together with similarities Instead we judge Indian logic from the standpoint of modern scientific logic in order to find out why it is logical in our sense. We have to begin with this question because our understanding of Nyāya depends on it. The characterisation of specific Indian idiosyncrasies like the 'style of Indian thought' is another task; however, it can only be the result, never the vantage point of research into Nyāya

NOTES

1 I mention here only the most important works from the years 1926–1932

2 Compare especially H. Scholz, *Geschichte der Logik*, Berlin 1931 (*Geschichte der Philosophie in Längsschnitten*, Heft 4)

3 I may refer to research by J. Łukasiewicz in the appendix to his work 'Philosophische Bemerkungen zu mehrwertigen Systemen des Aussagenkalküls', *Sitzungsberichte der Warschauer Gesellschaft der Wissenschaften*, XXIII (1930) Kl. III, p. 51

4 Compare Stcherbatsky, *op cit.*, p 1

5 Compare *Nyāyapraveśavṛttipañjikā*, p 43, *avyutpanna-vineya-gaṇam adhikṛtya samastānāṃ sādhanatvam.*

6 Compare St. Schayer, 'Kamalaśīlas Kritik des Pudgalavada', *RO.*, VIII (1932), p 75

7 According to Dinnāga (Haribhadra) the *viṣaya* of the *sādhana* is the *dharmaviśiṣṭo dharmin* Dharmakīrti leaves room for three interpretations: a) *dharmin*, b) *dharmin saha dharmeṇa*, and c) *dharma*.

Compare *Nyāyabindu*, p. 20; Stcherbatsky, *op. cit.*, I, p 235 and II, p. 133

8 For a representation of the Aristotelian syllogistic in formalised and axiomatic form compare: K. Ajdukiewicz, *Założenia logiki tradycyjnej*, Przeglad Filozoficzny (1927); Hilbert and Ackermann, *Grundzüge der theoretischen Logik*, Berlin 1928; J. Łukasiewicz, *Elemnty logiki matematycznej*, Warszawa 1929.

9 Łukasiewicz, *Elementy*, p. 16.

10 Kant's attempt to explain the syllogism by the basic thesis *nota notae est nota rei ipsius* [The sign of the sign is the sign of the thing-in-itself] is particularly misguided Unfortunately, Stcherbatsky, *op cit.*, I, took this interpretation seriously.

11 The difference is of fundamental importance. The real Aristotelian syllogism *εἰ γὰρ τὸ Α χατὰ παντὸς τοῦ Β, χαὶ τὸ Β χατὰ παντος τοῦ Γ, ἀνάγχη τὸ Α χατὰ παντὸς τοῦ Γ χατηγορεῖσθαι* is a formal-logical theorem the truth of which is independent on the value of the arguments *A*, *B*, and *Γ*. The traditional syllogism with two premises and the conclusion is however a 'rule of inference' which says that as long as somebody acknowledges the given premises he has the right to acknowledge the given conclusion. 'To acknowledge' and 'to have the right' are non-logical expressions which cannot be expressed in symbols. They do not feature in the real syllogism

12 Only since Petrus Ramus' syllogistic is it allowed to use a *terminus discretus sive singularis* [separate or singular term] for the subject. (Compare H. Scholz, *op. cit.*, p 39 and p. 68).

13 J. Łukasiewicz showed that Stoic logic is the ancient form of the propositional calculus and that it differs from the Aristotelian syllogistic 'no less than arithmetic differs from geometry'. (See his *Philosophische Bemerkungen*, p. 77 and *Elementy*, p. 15).

14 See his *Allgemeine Geschichte der Philosophie*, Vol I, p 32.

15 Here, I am partly repeating remarks I made in my paper 'Der indische und der aristotelische Syllogismus', *Bulletin de l'Academie Polonaise des Sciences et des Lettres*, Cracovie 1932, p. 99 and following. More examples for the application of the methods which I use here can be found in my paper 'Anfänge der Aussagenlogik in Indien', *Bulletin*, 1933. [See Essay 4, this volume].

16 The Stoic *modus ponens*: $p \supset q.\ p: \supset q$ is in some sense equivalent to this rule. However, it cannot replace it.

17 See H. Scholz, *op. cit*, p. 60 and H. Weil, *Philosophie der Mathematik*, p. 39 for the significance of this difference

18 This applies with the interesting restriction that the individual has to belong to a class. Otherwise it is impossible to construct a homologue and a general rule. (Compare G. Tucci, *The Nyāyamukha*, p. 7).

19 P. Masson-Oursel saw this correctly in his *La Philosophie Comparée*, p. 133.

20 *Tarka-Saṃgraha*, p. 233

21 See his *History of Indian Logic*, Appendix B.

22 *Op. cit.*, Vol. I, p. 26.

Chapter 6

Logic in India

Daniel H. H. Ingalls

1 ORIGINS

The origins of formal logic in India lie in exegesis and debate. By perhaps the 4th century B.C. the school of exegetes or interpreters of Vedic texts (*mīmāṃsā*) began to furnish technical terms and a few basic concepts that were to be used later in logic. Actual logical operations are first found in the patterns of debate, called in some schools *nyāya*, which crystallize about the 2nd century B.C. The opening argument of the Buddhist *Kathāvatthu* of this period falls into such a formal pattern. It contains a refutation that may be summarized thus:

> If my first statement (*a*) was true, then you should consent to my second (*b*). You are wrong to say that *a* is true but *b* is not true. If *b* is not true, then *a* is not true. You are wrong to say that *a* is true but *b* is not true

This is certainly an approach to propositional logic, as Stanisław Schayer has pointed out. But it is consistent with the practical nature of such texts that while logical operations are actually performed no general rules are yet given for their performance.

These patterns of debate were often very lengthy, their form being chosen for psychological or rhetorical effect. According to the Jaina author Bhadrabahu (1st century B.C.) the best pattern is one of ten members, which he lists as follows: (1) general thesis, (2) particular thesis, (3) general reason, (4) particular reason, (5) counter-argument, (6) denial of the counter-argument, (7) example, (8) doubting the

example, (9) laying the doubt, (10) conclusion. It is from such a pattern as this that the classical Indian syllogism, likewise called *nyāya*, arises.

2 THE OLD NYĀYA (PRACĪNA-NYĀYA)

The major school of Indian logic takes its name from the syllogism. The oldest writings of the school, the *Nyāyasūtras*, may go back to the time of Christ but acquired additions perhaps as late as A.D. 200. The early period of the school is characterized by intense and beneficial argument between orthodox (Hindu) and Buddhist logicians. Important contributions to logic were also made by the physicists (*vaiśeṣika*) in the early period and from the 5th century onward by the Jainas.

The classical Indian syllogism is found in the earliest Nyāya texts. It consists of five members and shows clearly its origin from a pattern such as Bhadrabahu's (*see above*). It has become a syllogism by the expansion of the "example" to include a statement of universal concomitance or pervasion (*vyāpti*). In the following example the particular argument is directed against the exegetes, who claimed that the word of the Veda is eternal.

1. Thesis: Word (is) non-eternal,
2. Reason: Because (it possesses) the property of being produced.
3. Example: What possess(es) the property of being produced (is) seen to be non-eternal, as a pot. What possess(es) the property of not being produced (is) seen to be eternal, as the soul.
4. Application: It (viz., word) (is) like this (viz., possesses the property of being produced).
5. Conclusion: Therefore, word (is) non-eternal.

The original of the above contains no finite verb. According to commentators the last three members only are assertions. In the first two the terms are simply brought together without anything yet being asserted of the truth or falsity of the collocation.

This syllogism contains three parts (*aṃśa*) or terms. (1) The *pakṣa* (field), viz., the subject of thesis and conclusion. It is called a field because the other two parts occur (*vartate*) in it. In the above example *pakṣa* = word. (2) The *hetu* (reason proper). In the example *hetu* = the property of being produced. (3) The *sādhya* (that which is to be proved). The early Nyāya argues about just what the *sādhya* is, *e.g.*, whether in

the above example it is "the non-eternality of word" or "word-as-non-eternal" or, what was finally agreed on, simply "non-eternality."

This analysis shows how the classical Indian syllogism differs both from those of Aristotle, the terms of which are classes, and from the formulas of propositional logic. The *pakṣa* is normally a single individual; *hetu* and *sādhya* are regularly properties, expressible in Sanskrit by an abstract noun The translation of the third member as "$F(x) \supset_x G(x)$" may refer to the same facts in a given instance as the Indian original, but the facts are not arranged in the Indian way. The letter F refers by an indissoluble expression to two notions which are quite distinct to the Indian logician: the *hetu* and the relation by which the *hetu* occurs In the later development of Nyāya either of these notions may be qualified independently of the other

The Buddhist Vasubandhu (4th century A.D) distinguishes between inference for others (*parārthānumāna*, *i.e.*, formal debate), which requires the presence of all five members, and inference for oneself (*svārthānumāna*), which requires only the first three. The syllogisms of later textbooks are regularly given in the three-membered form. Praśastapāda the physicist and the Buddhist Diṅnāga (both c. A.D. 400) give systematic lists of fallacies

Diṅnāga is the first to give a "wheel of reasons" (*hetucakra*), that is, a systematic list of possible *hetus*. His list is based on the distribution of the *hetu* with respect to the *sapakṣa* (objects other than the *pakṣa* but like it in being loci of the *sādhya*) and the *vipakṣa* (objects other than the *pakṣa* and unlike it in not being loci of the *sādhya*) There are nine possible distributions, as the *hetu* may occur in all, part of, or none of either of these areas

This wheel of reasons is vastly increased by Uddyotakara (*c.* A.D. 600) of the orthodox Nyāya, who gives 176 possible *hetus*. The increase is occasioned in the first instance by the addition of cases where *sapakṣa*, *vipakṣa*, or both simply do not exist Thus as an example of the third type: "Everything is eternal, because it (is) an object of knowledge." Other refinements of Uddyotakara are to distinguish cases where the *hetu* occurs in all, part, or none of the *pakṣa* itself, where the *hetu* is complex, *e.g.*, "Word (is) non-eternal, because while it (is) nameable it (is) an object of knowledge," etc.

The Buddhist Dharmakīrti (7th century) propounds a further division of *hetus* into: (1) Those which possess a common nature with the *sādhya*, *e.g.*, "This is a tree, because it is a *śiṃśapā* (tree)." (2) Those which are an effect of the *sādhya*, *e.g.*, "This hill possesses fire because it possesses smoke." (3) Those which are cases of

nonperception, *e.g.*, "There are no śiṃśapās here, because we perceive no trees." It is of this third class, which includes inferences from negative premisses and inferences leading to negative results, that Dharmakīrti's analysis is most elaborate. He lists 11 varieties.

The Old Nyāya is summed up from an orthodox standpoint by Vācaspati Miśra, who wrote his *Nyāyasucinibandha* in A.D. 976. The date A.D. 841, given in many books, is due to an error in identifying the era.

3 THE NEW NYĀYA (NAVYA-NYĀYA)

Udayana (11th century) and others were instrumental in altering the Nyāya to the form which it assumes in the hands of Gaṅgeśa (14th century according to the evidence adduced by Dinescandra Bhattacaryya). Gaṅgeśa for the first time expressly refers to his school as the New Nyāya. In the centuries which followed, other schools also contributed to logic, notably the pluralistic Vedānta of south India (*e.g.*, Jayatīrtha and Vyasatīrtha), the neogrammarians (*e.g.*, Nāgeśa Bhaṭṭa), and the Jainas. The following account is limited to the New Nyāya since its contributions appear to be the most important.

The chief innovations of the New Nyāya are three: a new method of universalization, rendered possible by the concept of limitation (*avacchedakatā*); the discovery of a number of laws similar to the theorems of propositional logic; a new interest in the definition of relations and the use of these relations in operations of considerable complexity.

The method of universalization springs from a dissatisfaction which had always been felt with quantifiers. "All things which possess smoke possess fire" had troubled even the old logicians and for more reasons than one. There was the formal difficulty of binders. Mountain fire does not occur in a kitchen nor kitchen fire on a mountain. Deeper than this was a problem of knowledge. Even if interpreted without cross-connection, such statements refer to facts which the Naiyayikas claim are impossible to be known except by inference. And inference cannot serve as the basis for inference. What we perceive, say the Naiyāyikas, are the generic principles (*jāti* or *vibhajakopādhi*) that reside in the individual manifestations with which the senses come in contact. If a universal statement is to serve as the basis of inference, it should be phrased in accordance with the facts presented by perception. The New Nyāya method of so phrasing

statements appears clumsy in English translation and can best be shown by a graduated example

For "All that possesses smoke possesses fire" let us first substitute the equivalent expression "No case of smoke occurs in what is not a locus of fire." And for this let us substitute again: "The absence of smoke which occurs in the locus of a generic absence of fire is a generic absence." The terms to be universalized are now (*a*) generic absence of fire and (*b*) generic absence (of smoke). Absence *a* is said to be such that its counterpositiveness (*pratiyogitā*, the nature of the thing which it denies) is limited (*avacchinna*) by fireness (*vahnitvāvacchinna-pratiyogitānirupitābhava*). That is to say, we are denying not this or that case of fire but any case you choose of an entity inhered in by fireness. Absence *b* is said to be an absence whose counterpositiveness is limited by smokeness.

Notice that in these substitutions, which sound so clumsy in English, the Sanskrit expression is a single compound word. The literal rendering of *vahnitvāvacchinna-pratiyogitānirupitābhava* would be fireness-limited-counterpositiveness-described-absence. It is this syntactical peculiarity which allows the New Nyāya to operate with such terms somewhat as the modern logician operates with the symbols *p* and *q* or *F* and *G* where these symbols stand for whole propositions or functions. Accordingly, we find in the New Nyāya definitions of conjunction, disjunction, and implication which cover the facts referred to by sentence connectives as well as class connectives. One must bear in mind, however, that a translation of these definitions into logistic notation is never an exact one. The New Nyāya units are never precisely propositions or classes; they are the referenda of abstract nouns. New Nyāya techniques are parallel in many respects to those of modern logic: thus, where the western mathematician or logician speaks of class of classes the Naiyāyika speaks of the abstract of an abstract; but parallel lines do not actually meet.

This New Nyāya method of universalizing by abstraction offers a quite satisfactory substitute for quantification so long as the number of terms and length of operations is not too great. Limits are imposed by human memory and corporeal breath but these limits are fairly wide. In formal debate Naiyāyikas of the present day will use words that run to 300–400 syllables and take more than a minute each to pronounce.

As counterpositiveness is limited by an abstract determining the nature of the entity denied, so are causeness, effectness, etc., limited

by abstracts which determine or show the precise selection of things caused or effected. A further step is taken by the technique of relational limitors. The counterpositiveness of absence limited by fireness is said to be limited also by the relation contact when we deny the presence of fire in a locus such as hearth, by a relation objectivity if we deny that fire is an object of knowledge, by identity if we deny that fire is water, etc. In this way the New Nyāya comes to investigate the relations between entities, and by simplifying all complex relations into chains of relations of two terms each, it is able to analyze situations of considerable complexity.

The New Nyāya reaches its height of analytical power with Raghunātha Siromaṇi (*c.* 1475 – *c.* 1550). This philosopher is as famous for the innovations he introduced in metaphysics, where he overthrew Nyāya tradition for a system much closer to Vedānta as he is for his logic. Raghunātha constructs definitions of concomitance and pervasion (*vyāpti*) that will fit cases of compound and complex *hetu* and *sādhya*. In his analysis of relations he comes on a discovery of the true nature of number. It is typical of his school that he does not distinguish abstracts or classes (*e.g.* pairs, triples) from the corresponding cardinal numbers (*e.g.*, 2, 3). He distinguishes the relation by which twoness is connected with the components of pairs (the relation of inherence) from the relation by which twoness is connected with the pairs as abstracts. The latter relation, called *paryāpti* (which may be translated literally by coining the phrase "circumtaining relation"), corresponds to what Frege in 19th-century Europe expressed by saying that a number belongs to a concept; it represents in another form Frege's insight that, *e.g.*, the number 2 should be attached to the concept, *satellite of Mars*, rather than to the concrete physical objects, Deimos and Phobos.

The creativeness of the New Nyāya, like that of all schools of Indian philosophy, declines from the beginning of the 18th century, but competent Naiyāyikas and a few brilliant ones are still to be found in Benares, Calcutta, Mysore and in the district of Nadia in Bengal, the birthplace of Raghunātha.

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Chapter 7

The Indian Variety of Logic

I. M. Bochenski

1 INTRODUCTION TO INDIAN LOGIC

A. Historical Survey

A sketch of the history of formal logic in India will be more intelligible to the reader if it is prefaced with some account of the basic evolution of Indian thought, which is but little known in the West.

With some simplification we can put the beginning of systematic thought in India in the last centuries B.C. Various religious, psychological and metaphysical conceptions are indeed known before that, but they first take on systematic form in the classical texts that survive from that time, texts called 'Sūtra' by the Brahmins – the word means both a statement of doctrine and a work consisting of such. Of these texts six are Brahmanic in character, the *Sāṃkhya-kārika*, the *Yoga-*, *Pūrva-Mīmāṃsā-*, *Vedānta-*, *Nyāya-* and *Vaiśeṣika-sūtra*. The last seems to have been first edited in about the first century A.D., the *Nyāya-sūtra* first about 200; their contents, however, are ascribed at least in part to an earlier period. Every one of these Sūtras has occasioned a swarm of commentaries, commentaries on commentaries, commentaries of the third order etc., and nearly the whole philosophical literature of India consists of commentaries. The teachings of these schools can be characterized thus:

Sāṃkhya: dualistic ontology and cosmogony.
Yoga: systematization of mythical and ascetical practice.

Pūrva-mīmāṃsā: monistic metaphysics.
Nyāya: epistemology, logic, and methodology.
Vaiśeṣika: realistic ontology and systematics.

These bodies of teaching often supplement one another, e.g. those of the *Vaiśeṣika* and *Nyāya*

Besides the Brahmans there arose, among others, two further religious communions: the Buddhists and the Jainas. Both took shape in the 6th century B.C and in the centuries round the beginning of our era developed highly speculative systems of thought which first found expression in some fundamental texts. Buddhism is of over-riding importance to us. It is divisible into two great tendencies: the Hīnāyāna (the little vehicle) and the Mahāyāna (the great vehicle). Within these two main streams again various schools arose. The chief schools of the Hīnāyāna are the pluralistic-realistic Sarvāstivāda and the phenomenalistic Santrāntika schools. In the Mahāyāna the first development was the negativistic relativism of the Mādhyamikas. The movement culminated in the idealism of the Vijñānavāda school. From among the followers of this last there should be mentioned at least the two brilliant brothers, the saintly Asaṅga, and Vasubandhu who was perhaps one of the most productive thinkers that history of philosophy has to show.

Indian philosophy quickly developed permanent controversies, but also fruitful exchange of thought between the different schools. From the 8th century on, Buddhism lost ground and within Brahmanism the Vedānta gained the upper hand, mainly owing to a series of prominent thinkers of whom the most important is Śaṅkara, 8–9th century. The final result, manifest even in the 10th century, is a unification: the Vedānta absorbed some doctrines of the other schools and also much Buddhist thought, and the controversies – such as that between the radical (*advaita*) pantheism of Śaṅkara and the moderate opinions of Rāmānuja (11th century) took place entirely within the Vedāntic school.

Essentially, we can speak of three main periods of Indian logic which roughly coincide with the three millennia of its history:

antiquity: approximately to the beginning of our era, the time of as yet unsystematic thought.

classical period: the first millennium A.D., marked on the one hand by controversies between schools, on the other by the construction of developed systems.

Modern period: the second millennium A.D., with predominance of the Vedānta.

B. Evolution of formal Logic

Formal logic (*nyāya-śāstra*) developed in India, as in Greece, from the methodology of discussion. Such a methodology was already systematically constructed in the 2nd century B.C. The first ideas which can be said to be formal-logical occur indeed as early as the *Vaiśeṣika-sūtra* (1st century A.D.), but the history of Indian formal logic properly begins with the *Nyāya-sūtra* (edited in the 2nd century A.D.). This 'logical' sūtra (so characterized by its very name) was the foundation of all Indian logical thought.

After the final redaction of the *Nyāya-sūtra* the next five to six centuries display controversies between the Buddhist, Brahmanist and also Jainist logicians. In all three camps logic was keenly cultivated. Among the most important thinkers are in the Naiyāyikas,[1] Vatsyāyana (5–6th cent.),[2] Uddyotakara (7th cent.) and Vācaspati Miśra (10th cent.);[3] in the Vaiśeṣikas primarily Praśastapāda (5–6th cent.) in the Mīmāṃsakas Kumārila (7th cent.). Perhaps still more important than those is the Buddhist Vasubandhu (4–5th cent.) and his brilliant pupil Dignāga (5–6th cent.) quite the greatest Indian logician, who founded an idealistic but unorthodox Vijñānavada-school. To this school there belong among others the commentator Dignāga, Dharmakīrti (7th cent.) and his commentator Dharmottara (8–9th cent.). In the same centuries occurred the crystallization of formal logic which is plainly present in the 7th; a genuine and correct, though still in many ways elementary formal logic has developed from the methodology of public discussion.

To the third period of Indian philosophy there corresponds a new epoch of logic, that of the Navya-Nyāya, the new Nyāya Given shape by the *Tattva-cintāmaṇi*, the great work of Gaṅgeśa (14th cent.), this logic was developed with the utmost subtlety in a spirit remarkably like that of late western Scholasticism, though the basic ideas and methods are quite different.

Of the innumerable logicians of this period that best known are Jayadeva (15th cent.), Ragunātha (16th cent.), Mathurānātha, Jagadīśa (17th cent.), and the author of a compendium not unlike the *Summalae Logicales*, Annambhaṭṭa (17th cent.).

Today the study of Indian logic has been re-introduced in India along with the resumption of speculative Vedāntic thought (Sri

Aurobindo). But it is not yet possible to form a judgment about this development.

We set out the most important names and dates in a table:

Pre-logical methodology of discussion

THE OLD SCHOOL

Nyāya-sūtra (final redaction in 2nd century A.D.)

NAIYĀYIKAS	BUDDHISTS	OTHERS
	Vasubandhu (4–5 c.)	
Vatsyāyana (5–6 c.)		
	Dignāga (5–6 c.)	Praśastapāda (5–6 c.)
Uddyotakara (7 c.)		Kumārila (7 c.)
	Dharmakīrti (7 c.)	
	Dharmottara (8–9 c.)	
	Śāntaraksita (8 c.)	
Vācaspati Miśra (10 c.)		(Prābhākara)
Udayana (end 10 c.)		Śrīdhara (ca. 991)

THE NEW SCHOOL

Gaṅgeśa	14 c.
Jayadeva	1425–1500
Ragunātha	ca. 1475–ca. 1550
Mathurānātha	ca. 1600–ca. 1675
Jagadīśa	ca 1600
Annambhaṭṭa	after 1600.

C. State of research

The present (1955) state of research in the field of Indian logic has a certain resemblance to that in the field of western Scholastic logic. Most of the logical texts are still unpublished, and many, especially the Buddhist ones, are only available in Tibetan or Chinese translations; many too are no longer extant But the publication of these texts would at first bring little result – unlike the Scholastic case, since an extensive philological formation would be required before they could be read in the originals, while people so equipped have commonly not studied systematic logic. We are even worse off for

translations than for editions; only very few texts have been completely translated. Of others we have only fragments in western languages, in many cases nothing at all.

On the other hand we already have a number of scientific compendia and a comprehensive history of the literature of Indian logic by S. C. Vidyābhūṣaṇa (1921). But this is similar to Prantl's work in that an understanding of logical doctrine is not to be looked for (though it is very important in other respects), and then again many remarks on the literary history need revision.

Monographs fall into two groups. One derives from the work of indologists, whose logical formation stems from the so-called 'classical' logic. The most important works are those of A. B. Keith (1921), H. N. Randle (1930) and Th. Shcherbatskoy (1932). Useful as they are, they yet contain (especially the monumental work of Shcherbatskoy on Buddhist logic) so many misunderstandings of systematic questions, that their results need to be thoroughly revised. The second group is composed of a few writings by indologists formed in mathematical logic, e.g. the works of S. Schayer (1932–3), the commentary of A. Kunst (1939) – both belonging to the school of Łukasiewicz – and the monograph of D. Ingalls (1951) which is perhaps the most important in the field.

This is all very sad. Even on points of purely literary history there is great uncertainty. In Indological studies one is accustomed indeed to find the dating of a thinker fluctuating between two centuries, but this prejudices the possibility of solving various problems and important questions, e.g. the as yet obscure relation between Dignāga and Praśastapāda, while even so prominent a logician as Vācaspati Miśra can be ascribed to the 9th or 10th century indifferently. The content too of Indian logic is in great part unexplored. Ingalls' work revealed to the historian of logic a new intellectual world, that of the Navya-Nyāya, of which, at least in the west, very little was known. The mass of logical problems touched on there is so great that a generation of well-qualified investigators is needed to clear it up thoroughly. The same can be said of the classical period.

To summarize, although much is still obscure, or even unknown, we have a certain insight into the development of Indian logic at the beginning of the classical period, and are even perhaps already in a state to understand in some degree the rise of definitely formal logic. Further we have some knowledge of what may be called the final form of this logic in the Navya-Nyāya. But that is all. We cannot as yet speak of a history of logical problems in India.



D. Method

In spite of this unsatisfactory state of research it seems indispensable to give a brief exposition of some Indian problems, primarily those concerning the rise of formal logic. For, defective as is our knowledge of other aspects, this one can actually be followed better in India than in Greece. The evolution that we here describe in a way parallel to the other case, took in fact very much longer in India, so that the growth of a logical problematic can be seen in much more detail than in the west.

It seems useful to complete our exposition with some details of later logic, presenting only fragments which have been in essentials taken over from Ingalls. Those doctrines are stressed which either illustrate the specific character of Indian logic or may be of interest from the standpoint of systematic logic. Of the many details not touched on, we may mention the highly developed sophistic.

That our brief survey, entirely dependent on translations, is after all very unsatisfactory, should be evident *a priori*. Thanks to the help of competent indologists who are also logicians we yet hope that we have given the essentials. For the rest, it seemed better in the context of this book to give an incomplete exposition of Indian logic than to omit it entirely, for it, and it alone, serves the historian in the most important task of making a comparison.

Minor alterations made to the translations we have used, are not noted. Additions made by the original translators and by ourselves are alike put in parentheses.

2 THE PRECURSORS

A. Milinda-Pañha

In order to give some impression of the spirit in which the discussions were conducted which gave rise to Indian logic, we begin with a passage from the Buddhist work *Milinda-pañha*. It relates a conversation between the Greek king Menander, who ruled over the Punjab and part of what later became the United Provinces about 150 B.C., and the sage Nāgasena The work itself dates from much later. Nāgasena's words reveal a world of discussion not unlike that which we meet in Plato

> The king said: 'Excellent Nāgasena, would you like to hold further discussion with me?'

> 'If you are willing to discuss like a wise man, O king, yes, indeed; but if you want to discuss like a king, then no.'
> 'How do the wise discuss, excellent Nāgasena?'
> 'In the discussions of the wise, O king, there is found unrolling and rolling up, convincing and conceding; agreements and disagreements are reached. And in all that, the wise suffer no disturbance. Thus it is, O king, that the wise discuss.'

B. Kathāvatthu

We can see how such a discussion was conducted, and the strictly defined rules that guided it, from another Buddhist work, the *Kathāvatthu*, perhaps contemporaneous with the last text. Here is a discussion between two disputants about the knowability of the human soul.

(A.) Anuloma ('The way forward')

Theravādin: Is the soul known in the sense of real and ultimate fact?

Puggalavādin: Yes.

Theravādin: Is the soul known *in the same* way as a real and ultimate fact is known?

Puggalavādin: Nay, that cannot truly be said.

Theravādin: Acknowledge your refutation:

(1) If the soul be known in the sense of a real and ultimate fact, then indeed, good sir, you should also say, the soul is known in the same way as [any other] real and ultimate fact [is known].

(2) That which you say here is wrong, namely, (*a*) that we ought to say, 'the soul is known in the sense of a real and ultimate fact', but (*b*) we ought not to say, the soul is known in the same way as [any other] real and ultimate fact [is known].

(3) If the latter statement (*b*) cannot be admitted, then indeed the former statement (*a*) should not be admitted.

(4) In affirming the former statement (*a*), while

(5) Denying the latter (*b*), you are wrong.

(B.) Paṭikamma ('The way back')

Puggalavādin: Is the soul not known in the sense of a real and ultimate fact?

Theravādin: No, it is not known.

Puggalavādin: Is it unknown in the same way as any real and ultimate fact is [*known*]?

Theravādin: Nay, that cannot truly be said.

Puggalavādin: Acknowledge the rejoinder:

(1) If the soul be not known in the sense of a real and ultimate fact, then indeed, good sir, you should also say: not known in the same way as any real and ultimate fact is known.

(2) That which you say here is wrong, namely, that (*a*) we ought to say 'the soul is not known in the sense of a real and ultimate fact', and (*b*) we ought not to say: 'not known in the same way as any real and ultimate fact is known'.

If the latter statement (*b*) cannot be admitted, then indeed the former statement (*a*) should not be admitted either.

In affirming (*b*), while denying (*a*), you are wrong.

Anuloma and Paṭikamma are only two of the five phases of the 'first refutation' (*paṭhama niggaha*). On this first, there follow the second, third, fourth and fifth, differing only in small details such as 'everywhere', 'always' and 'in everything'; then come four more in which 'known' and 'unknown' replace one another.

It can hardly be denied that this procedure, which evidently follows a fixed rule of discussion, seems to us rather too long and complicated. But it is hard to understand how Randle could conclude from it that the author of the *Kathāvatthu* had no respect for logic. For out text shows clearly that the disputants not only apply definite and accepted rules of formal logic, but almost formulate them expressly.

S Schayer also saw this. But in speaking of 'anticipations of propositional logic' in the *Kathāvatthu*, he seems to go too far. One could indeed think of the various statements as substitutions in the following propositional formulae:

(1) If p, then q;
therefore (2) not: p and not q;
therefore (3) if not q, then not p.
(1) If not p, then not q;
therefore (2) not: not p and not not q;
therefore (3) if not q, then not not p.

But that would be to credit the Indian thinkers with a power of abstraction which they possessed no more than the pre-Aristotelians.

The rules applied by our author are rather to be interpreted like those we found among the early Greeks; rules, then, which rather correspond to the following formulae of the logic of terms:

(1) If A is B, then A is C;
therefore (2) not: (A is B) and not (A is C);
therefore (3) if not (A is C), then not (A is B).
(1) If A is not B, then A is not C;
therefore (2) not: (A is not B) and not (A is not C);
therefore (3) If not (A is not C), then not (A is not B).

Here we note that (*B.*) results from (*A.*) on substitution of 'A is not B' for 'A is B' and of 'A is not C' for 'A is C', which might suggest that some propositional rules were already in conscious use. But abstract formulation of such rules is nowhere to be found in this context, and the substitutions show that the thought revolved round the fixed subject A.

It should further be noticed that the passage from (1) to (2) involves a term-logical analogue of a well-known definition of implication, and that (2) and (3) together constitute a kind of law of contraposition or rather a *modus tollendo tollens* in a term-logical version.

The important point historically, is that the beginning of Indian logic corresponds so closely to that of Greek logic.

C. The ten-membered formula

It may be that the *Kathāvatthu* exhibits a level to which the methodology of discussion did not often attain at that time; certainly we find many later texts which are further removed from formal logic. An extract from the *Daśavaikālika-niryukti* of the younger Bhadrabāhu, a Jaina, may serve as an example. He lived before 500 A.D., perhaps about 375. The importance of this text is that it shows one a process from which the later five-membered syllogism may have developed.

(1) The proposition (*pratijña*): 'to refrain from taking life is the greatest of virtues.'

(2) The limitation of the proposition (*pratijña-vibhakti*): 'to refrain from taking life is the greatest of virtues, according to the jinist Tīrthaṅkaras.'

(3) The reason (*hetu*): 'to refrain from taking life is the greatest of virtues, because those who so refrain are loved by the gods, and to do them honour is an act of merit for men.'

(4) The limitation of the reason (*hetu-vibhakti*): 'none but those who refrain from taking life are allowed to remain in the highest place of virtue'

(5) The counter-proposition (*vipakṣa*): 'but those who despise the jinist Tīrthaṅkaras and take life are said to be loved by the gods, and men regard doing them honour as an act of merit. Again, those who take life in sacrifices are said to be residing in the highest place of virtue. Men, for instance, salute their fathers-in-law as an act of virtue, even though the latter despise the jinist Tīrthaṅkaras and habitually take life. Moreover, those who perform animal sacrifices are said to be beloved of the gods.'

(6) The opposition to the counter-proposition (*vipakṣa-pratiṣedha*): 'those who take life as forbidden by the jinist Tīrthaṅkaras do not deserve honour, and they are certainly not loved by the gods. It is as likely that fire will be cold as that they will be loved by the gods, or to do them honour will be regarded by men as an act of merit. Buddha, Kapila and others, though really not fit to be worshipped, were honoured for their miraculous sayings, but the jinist Tīrthaṅkaras are honoured because they speak absolute truth"

(7) An instance or example (*dṛṣṭanta*): 'the *Arhats* and *Sādhus* do not even cook food, lest in so doing they should take life. They depend on householders for their meals.'

(8) Questioning the validity of the instance or example (*āśaṅkā*): 'the food which the householders cook is as much for the *Arhats* and *Sādhus* as for themselves. If, therefore, any insects are destroyed in the fire, the *Arhats* and *Sādhus* must share in the householders' sin. Thus the instance cited is not convincing'

(9) The meeting of the question (*āśaṅkāpratiṣedha*): 'the *Arhats* and *Sādhus* go to the householders for their food without giving notice, and not at fixed hours. How, therefore, can it be said that the householders cooked food for the *Arhats* and *Sādhus*? Thus the sin, if any, is not shared by the *Arhats* and *Sādhus*.'

(10) Conclusion (*nigamana*): 'to refrain from taking life is therefore the best of virtues, for those who so refrain are loved by the gods, and to do them honour is an act of merit for men'

3 VAIŚEṢIKA- AND NYĀYA-SŪTRA

So far we have spoken of the percursors of Indian logic; now we shall consider the first step in its development, which takes place mainly in the two sister sūtras, the *Vaiśeṣika-* and *Nyāya-sūtra*. The *Vaiśeṣika-sūtra* is older, and in most respects more important for logic; but the *Nyāya-sūtra* underlies the whole later development of Indian logic, constituting, indeed, its *Organon*.

First we give the doctrine of categories from the *Vaiśeṣika-sūtra*, then some short passages from the same source about inference, and finally go on to the *Nyāya-sūtra* and its five-membered syllogism.

A. Vaiśeṣika-Sūtra

1. *Doctrine of categories*

The supreme good (results) from the knowledge, produced by a particular piety, of the essence of the predicables, substance, attribute, action, genus, species, and combination, by means of their resemblances and differences.

Earth, water, fire, air, ether, time, space, self, and mind (are) the only substances.

Attributes are colour, taste, smell, and touch, numbers, measures, separateness, conjunction and disjunction, priority and posteriority, understandings, pleasure and pain, desire and aversion, and volitions.

Throwing upwards, throwing downwards, contraction, expansion and motion are actions.

The resemblance of substance, attribute, and action lies in this that they are existent and non-eternal, have substance as their combinative cause, are effect as well as cause, and are both genus and species.

The resemblance of substance and attribute is the characteristic of being the originators of their congeners.

Substance-ness, attribute-ness, and action-ness are both genera and species.

(The statement of genera and species has been made) with the exception of the final species.

Existence is that to which are due the belief and usage, names '(It is) existent', in respect of substance, attribute and action.

Existence is a different object from substance, attribute and action.

And as it exists in attributes and actions, therefore it is neither attribute nor action.

(Existence is different from substance, attribute and action) also by reason of the absence of genus-species in it.

2. *Inference*

Besides the doctrine of categories, the *Vaiśeṣika-sūtra* contains the first Indian account of inference known to us.

> 'It is the effect or cause of, conjunct with, contradictory to, or combined in, this' – such is (cognition) produced by the mark of inference.
>
> 'It is its' (– this cognition is sufficient to cause an illation to be made); whereas (the introduction of) the relation of effect and cause arises from a (particular) member (of the argument).
>
> Hereby verbal (cognition is) explained.
>
> Reason, description, mark, proof, instrument – these are not antonyms.
>
> (Comparison, presumption, sub-sumption, privation, and tradition are all included in inference by marks), because they depend, for their origin, upon the cognition, namely, 'It is its'.

B. Nyāya-sūtra

1. *Text*

As has been said, the *Nyāya-sūtra*, the 'logical' sūtra, constitutes the fundamental text for the whole of Indian logic. We cite some passages in the translation of Vidyābhusana, for their pioneer character:

> 1. Supreme felicity is attained by the knowledge about the true nature of sixteen categories, viz. Means of right knowledge, object of right knowledge, doubt, purpose, familiar instance, established tenet, members, confutation, ascertainment, discussion, wrangling, cavil, fallacy, quibble, futility, and occasion for rebuke.
>
> 2. Pain, birth, activity, faults and misapprehension – on the successive annihilation of these in the reverse order, there follows release.

The Indian Variety of Logic

> 3. Perception, inference, comparison and word (verbal testimony) – these are the means of right knowledge.
>
> 4. Perception is that knowledge which arises from the contact of a sense with its object and which is determinate, unnameable and non-erratic.
>
> 5. Inference is knowledge which is preceded by perception, and is of three kinds, viz., a priori, a posteriori and 'commonly seen'.
>
> 6. Comparison is the knowledge of a thing through its similarity to another thing previously well known.
>
> 7. Word (verbal testimony) is the instructive assertion of a reliable person.
>
> 8. It is of two kinds, viz., that which refers to matter which is seen and that which refers to matter which is not seen
>
> 25. A familiar instance is the thing about which an ordinary man and an expert entertain the same opinion.
>
> 26. An established tenet is a dogma resting on the authority of a certain school, hypothesis, or implication.
>
> 27. The tenet is of four kinds owing to the distinction between a dogma of all the schools, a dogma peculiar to some school, a hypothetical dogma, and an implied dogma.
>
> 32. The members (of a syllogism) are proposition, reason, example, application, and conclusion.
>
> 33. A proposition is the declaration of what is to be established.
>
> 34. The reason is the means for establishing what is to be established, through the homogeneous or affirmative character of the example.
>
> 35. Likewise through heterogeneous or negative character.
>
> 36. A homogeneous (or affirmative) example is a familiar instance which is known to possess the property to be established and which implies that this property is invariably contained in the reason given.
>
> 37. A heterogeneous (or negative) example is a familiar instance which is known to be devoid of the property to be established and which implies that the absence of this property is invariably rejected in the reason given.
>
> 38. Application is a winding up, with reference to the example, of what is to be established as being so or not so.

> 39. Conclusion is the re-stating of the proposition after the reason has been mentioned.

The part of this text that we find most interesting is that containing sūtras 32–39, which give what is, so far as we know, the first description of the five-membered syllogism. The classic and constantly repeated example – as standard as the western 'all men are mortal, Socrates is a man, etc.' – is the following:

> Proposition: There is fire on the mountain;
> Reason: Because there is smoke on the mountain;
> Example: As in the kitchen – not as in a lake;
> Application: It is so;
> Conclusion: therefore it is so.

Before attempting to comment on this formula, we should like to listen to the first commentator on the *Nyāya-sūtra*.

2. *Vātsyāyana's commentary*

We cite, in the version of Jhā, Vātsyāyana's remarks on some of the 'members':

> The 'statement of the proposition' is that assertion which speaks of the subject which is intended to be qualified by the property which has to be made known or proved.
>
> That which 'demonstrates' – i.e. makes known or proves – the probandum – i.e. the property to be proved (as belonging to the subject), – through a property common to the example, is the 'statement of the probans' That is to say, when one notices a certain property in the subject (with regard to which the conclusion is to be demonstrated) and notices the same property also in the example, and then puts forward that property as demonstrating (or providing) the probandum, – this putting forward of the said property constitutes the 'statement of the probans'. As an example (in connection with the conclusion 'sound is not eternal') we have the statement 'because sound has the character of being a product'; as a matter of fact everything that is a product, is not eternal.

On this text the translator, Jhā, remarks: 'The term *sādhya* is used in the present text rather promiscuously. It stands for the probandum, the predicate of the conclusion, and also for the subject, the thing in regard to which that character is to be demonstrated.'

> The 'statement of the probans' is that also which demonstrates the probandum through dissimilarity to the example (i.e. through a property that belongs to the example and not to the probandum). 'How?' For example, 'sound is non-eternal, because it has the character of being produced, – that which has *not* the character of being produced is always eternal'.
>
> For instance in the reasoning 'sound is non-eternal, because it has the character of being produced', what the probans 'being produced' means is that being produced, it ceases to be, – i.e. loses itself. – i.e. is destroyed. Here we find that being produced is meant to be the means of proving (i.e. the probans) and being non-eternal is what is proved (the probandum); and the notion that there is the relation of means and end between the two properties can arise only when the two are found to co-exist in any one thing; and it arises only by reason of 'similarity' (of a number of things in every one of which the two properties are found to coexist). So that when one has perceived the said relation in the familiar instance, he naturally infers the same in the sound also; the form of the inference being: 'Sound also is non-eternal, because it has the character of being produced, just like such things as the dish, the cup and the like. And this is called 'statement of the example' (*udāharaṇa*), because it is what is the means of establishing, between the two properties, of the relation of means and end.
>
> When the example cited is the homogeneous one, which is similar to the subject, e.g. when the dish is cited as the example to show that it is a product and is non-eternal, we have the 're-affirmation' or 'application' stated in the form 'sound is so', i.e. 'sound is a product; where the character of being a product is applied to the subject *sound*.
>
> When the example cited is the heterogeneous one, which is dissimilar to the subject, e.g. when the soul is cited as an example of the substance which, not being a product, is eternal, – the 're-affirmation' of 'application' is stated in the form 'sound is not so', where the character of being a product is reasserted of the subject *sound* through the denial of the application of the character of not being produced. Thus there are two kinds of re-affirmation, based upon the two kinds of example.

3. *Interpretation*

Combining these explanations, we get the following scheme:

(1) We want to prove a property – not being eternal – of a subject – sound. This purpose is expressed in the 'proposition'.
(2) To effect it, we use the 'reason', which consists in another property – being produced – that we have noticed in sound.
(3) We next exemplify the matter in, say, a dish, which is produced and is not eternal, showing that these two properties co-exist in the dish and other things of that kind. This is the 'example'. It can also be formulated negatively, as when we adduce something in which absence of the probandum accompanies absence of the reason; in the classic example this is a lake.
(4) Having done that, we assert that the same connection between being produced and not being eternal occurs in the subject – sound. This is the 'application'.
(5) And so we conclude that in sound too, not being eternal must occur.

The reader accustomed to western logic may find this process strange, but the Indian formula loses its strangeness, and even seems quite natural, when it is remembered that it is not the result of reflection about the Platonic διαίρεσις, but merely the fixing of a method of discussion. The following sequence is quite natural in discussion:

A.: I state that *S* has the character *P* (1).
B.: Why?
A : Because *S* has the character *M* (2).
B.: So what?
A.: Well, both *M* and *P* characterize *X*, and neither of them *Y* (3). So it is in our case (4). Therefore *S* has the character *P* (5).

That is just the form of our 'syllogism'. But what logical formula underlies it? That question formed the subject of a centuries-long discussion in India, of which we have only partial knowledge and understanding. Some details are given in the next chapter. One point already emerges from the *Nyāya-sūtra* and Vātsyāyana, that we should not look for any universal premisses, not, therefore, for a syllogism of the western kind. Vātsyāyana does once say 'all'; but this should be regarded as accidental, for there is nothing of the kind in the *Nyāya-vārttika* of Uddyotakara Later history also shows how difficult the Indian logicians found it to grasp the universal. The original

formula of the sūtras is simply an argument by analogy from some individuals to others, rhetorical rather than logical in character. Neither the sūtras nor Vātsyāyana have achieved a properly formal logic.

It has been objected to this interpretation of the formula that besides the 'syllogism' the sūtras give another means of knowledge, the 'comparison'. But this is again an argument by analogy, so that we should have to accept two such arguments in the sūtras. However, the objection is not sound, since the 'comparison (*upamāna*) was expounded in the Nyāya tradition, not as an argument from analogy in the ordinary sense, but as one of a quite special (metalinguistic) kind, an argument about a name. This can best be seen in the *Tarka-Saṃgraha*, a late text, but true to the *Nyāya* tradition:

> Comparison (*upamāna*) is the efficient cause of knowledge of similarity. This (in its turn) is knowledge of the relation between a name and the thing it names .... Example: Whoso does not know the gayal, hears from some forester that it is like the domestic ox; going into the forest and remembering this saying, he sees an object like a domestic ox. At once there arises in him knowledge by similarity: 'That is what is called a "gayal".'

So, following the plain text of the sūtra and Vātsyāyana, we may take the pretended 'syllogism' not as a syllogism but as a formula for inference by analogy, of a rhetorical kind. We shall now see how this became a genuine law, or rule, of formal logic.

4 THE RISE OF FORMAL LOGIC

A. Main stages of development

What Plato is to Aristotle in formal logic, the *Nyāya-sūtra* is to, say, Dharmakīrti, save that the *Nyāya-sūtra* lacks that idea of universal law which in Plato opened the way to the rise of western logic. It was this idea which brought about the speedy emergence of logical form in the west. But in India, logic took shape very slowly, in the course of centuries and under the auspices of methodology. However, it is just this step-by-step, 'natural' development of Indian logic which gives it its great historical interest.

Though only partially acquainted with this development, we can determine some of its phases. Their order of succession is not altogether clear, but we can be certain of their occurrence and sometimes of their temporal relationship. Thus we obtain the following scheme:

First step: The establishment of a formal rule of syllogism (the *trairūpya*) based on examples. According to G. Tucci, Vasubandhu will have known this.

Second step: Dignāga developed the *Trairūpya* into a formal syllogistic – the 'wheel of reasons' (*hetu-cakra*). Uddyotakara carried this further still.

Third step: The components of the syllogism were reduced to three, the probandum no longer being resumed in the conclusion, and the application being dropped. A distinction is also made between a syllogism for oneself and a syllogism for another (*svārtham* and *para-artham*); the first comprises three stages, the second the classic five. Dharmottara says that Dignāga was the first to make this distinction, with which opinion Shcherbatskoy agrees.

Fourth step: The word '*eva*' ('*only*') was added to the *trairūpya*; this radically changed the exemplification from a mere exhibition of examples to a universal premiss. This addition is not to be found in the 5th century, but seems to have been generally accepted in the 7th, being found, for example, in Dharmakīrti.

Fifth step: The concept of universal law emerged. There were two technical terms in this connection: the 'not occurring elsewhere' of the Jainas (*anyathānupapannatva*), and 'pervasion' (*vyāpti*). Both were used in the 7th century. There were of course earlier premonitions; e.g. the word '*vyāpaka*' and its cognates often occurs in Vātsyāyana, but in a physical sense. The same author once has '*vyāpakatvam*' in a logical sense, but this may be a later addition since the word is missing in several manuscripts.[4] Contrary to the opinion of Shcherbatskoy, we can be sure that Vasubandhu knew as little of 'universal connection' as Dignāga, but in the 8th century Śāntarakṣita and Kamalaśīla rejected it as a basis for syllogism.

The emergence of the concept of universal law marks Indian thought as having attained to the level of formal logic. Examples continue to be used, but only as a concession to the needs of communication; once clearly elaborated, the syllogistic formula has no need for examples. Often, in fact, the word 'example' merely marks the statement of universal connection.

B. Terminology

Before exemplifying in texts the development that has been sketched, we briefly elucidate the more important technical terms in the accompanying table.[5] They are not easily translated into western

languages, as the concepts they refer to cannot be paired off with those of the Greeks, and they are, moreover, nearly all ambiguous.

Technical terms

SANSKRIT	CLASSIC EXAMPLE	MEANING	TRANSLATIONS	SYMBOL
pakṣa	mountain	object of discussion	subject	S
linga lakṣaṇa	smoke	sign, mark characteristic	mark, middle term	*M*
hetu	1) smoke 2) because of smoke	1) reason 2) justification	1) reason 2) justification	*M*
dṛṣṭānta	cowherd, lake	example	example	
sapakṣa	cowherd	example like the *pakṣa*	*sapakṣa*	*XP*
vipakṣa	lake	example unlike the *pakṣa*	*vipakṣa*	*X*-not-*P*
sādhya	1) fire 2) mountain	predicate to be proved, often also 2) = *pakṣa*	probandum	1) *P* 2) S
dharma	fieriness smokiness	quality, form	quality	
dharmin	the mountain is *dharmin* in respect of fieriness and smokiness	subject of the quality,	bearer of the quality	
pakṣadharma	the mountain's being fiery	possession of the *dharma* by the *pakṣa*		S-as-*M*
anumeya		1) *pakṣa* 2) *sādhya* (1) 3) *pakṣadharma*	*probandum*	1) S 2) *P* 3) S as having

C. The three-membered syllogism

Our first text is a methodological one from Dignāga, directed against the Nyāya, and with a remarkably modern sound:

> There are only two means of cognition (*pramāṇas*), I mean inference and direct perception, for those such as communication, analogy (*upamāna*) etc. are contained in these two. There are only two means of cognition by means of which we can grasp a thing in itself (*svalakṣana*) and its universality (*sāmānyalakṣana*); there is no other object of cognition than these two (and no other) that can be grasped by one of these means of cognition.

The great Indian logician goes on to state that the syllogism – every syllogism – needs only three components:

> We maintain that just as an undoubtedly valid syllogism is attained by someone for himself, (so too) an undoubtedly valid syllogism is produced in another's reason. It shows the connection (of the probandum) with the *pakṣadharma* (i.e. the subject as qualified by the middle term), and the exclusion of everything separated from the probandum.
>
> The reason (*hetu*) is formulated to show that the *pakṣadharma* is present in the probandum; the example is formulated to show that it is inseparably linked with it; the proposition is formulated to show the probandum.
>
> Hence no other component is required for the formulation of a syllogism, beyond those stated. In saying this I contradict the opinion of those logicians who count the desire for knowledge (*jijñāsā*), the application and the conclusion as components of the syllogism
>
> Here it could be objected that if this is so, the giving of the example is not a special component, since it only makes clear the sense of the reason (I answer that) though this is true in essentials, yet the statement of the reason is only to say that this has the nature of what it is to be *pakṣadharma* – it cannot show that it is present in cases of presence (of the probandum), absent in cases of absence (of the probandum). Consequently it is necessary to adduce distinctly the positive (*sapakṣa*) and negative (*vipakṣa*) examples.

So Dignāga's three-membered syllogism consists of justification, examples and proposition, i.e. of the second, third and first stages of the classic five-stage syllogism, application (4) and conclusion (5) being dropped. After this reduction the classic example becomes:

> Proposition: There is fire on the mountain,
> Reason: Because there is smoke on the mountain;
> Example: as in the kitchen, where there is fire, not as in the lake, where there is no fire.

But something more important underlies this formula, namely the thought of an inseparable connection of *M* with *P*. The thought is only expressed in passing, but it is there. Yet this connection can only be intuited in examples, and Dignāga's logic is not ready to dispense with them, as the last quotation shows. This point can be still more clearly seen in the doctrines of the *Trairūpya* and the 'wheel of reasons'.

D. The three-membered rule: *Trairūpya*

In Praśastapāda this rule, the name of which means 'the three characteristics (of the reason)', has the following form:

> What is conjoined with the probandum, and has been found in what possesses the probandum, and is always absent in its absence, is the mark (*liṅga*) which brings about inference.

Dignāga writes:

> It is evident that this is the only valid rule of inference: if (1) the presence of this definite mark (*liṅga*) in the subject (*pakṣa*) has been stated, and if we remember that (2) the same mark is certainly in everything similar to the subject (*sapakṣa*), but (3) absolutely absent in everything unlike it (*vipakṣa*), then the result of the inference is certainly valid.

It cannot be denied that this text has its obscurities, and both Indians of old and modern Europeans have exercised great subtlety in trying to elucidate it. But Dignāga's practice, in relation to his 'wheel of reasons' shows that he is considering the following three-membered formula:

(1) *M* occurs in *S* (smoke on the mountain);
(2) *M* occurs in *XP* (smoke in the kitchen, which fire has);
(3) *M* does not occur in *X*-not-*P* (no smoke in the lake, which no fire has); therefore *P* occurs in *S*.

E. Wheel of reasons: *Hetu-cakra*

Dignāga elaborated the *trairūpya* in a table called the 'wheel of reasons' (*hetu-cakra*), the first Indian attempt at a formal logic. Here is a metalogical formulation of the 'wheel':

> A middle term or quality of the subject of inference (*pakṣa-dharma*) first takes three forms, according as it does or does not reside in the two possible ways in the *sapakṣa*. And in each of these three possible cases the middle term does or does not reside in the two ways in the *vipakṣa* . . . Among these a middle term which is present in (either of) the two ways in the *sapakṣa*, and is absent in the *vipakṣa*, is a valid reason. What differs from this is either contradictory or inconclusive

The two possible ways of the middle term being in the *sapakṣa* are: (1) that *M* is in all, (2) that *M* is in some; there is also the third possibility, not here mentioned, that (3) *M* is in no *sapakṣa*. That is why Dignāga speaks of 'three possible cases'. Similarly there are three cases in regard to the *vipaksa*, that *M* can be in all, some or none. Thus there are nine possible cases in all. Symbolizing the three cases by '*A*', '*I*' and '*E*', we get the following table, where the first letter relates to the *sapakṣa*, the second to the *vipakṣa*:

1. *AA*	2. *AE*	3. *AI*
4. *EA*	5. *EE*	6. *EI*
7. *IA*	8. *IE*	9. *II*

Of these moods only two, viz. 2 and 8, are valid. Dignāga worked all this out in terms of substitutions: but we only have his text in a translation by Vidyābhūṣana from the Tibetan, and as it does not seem reliable, we do not quote it. Instead, here is a short summary by Vācaspati Miśra in his *Nyāya-varttika-tātparya-ṭīkā:*

> The nine middle terms used to prove eternality and the other probanda are: knowable, product, non-eternal; product, audible, effect of volition; non-eternal, effect of volition, intangible.

Uddyotakara completed this table in the following way: first he considers cases in which there is no *sapakṣa*, or it may be, *vipakṣa*, which gives seven further moods. Using 'Λ' for these cases, we get:

10. AΛ	11. *I*Λ	12. *E*Λ
13. Λ*A*	14. Λ*I*	15. Λ*E*
	16. ΛΛ	

of which 10, 11 and 15 are valid, so that we now have five valid moods in all.

Uddyotakara then goes on to consider the occurrence or non-occurrence of the middle term in the subject, and other circumstances besides, so that in sum his valid and invalid moods are not less than 176. Those in which the *hetu* is compound (and which Prof. D. Ingalls has pointed out to the author) deserve special attention. An example is: 'A word is not eternal, because it can be named and is an object of knowledge'.

Primitive and pre-logical as all this may seem, it should not be overlooked that the *hetu-cakra* contains some historically interesting details. A first point to note is that the Indians do not admit four kinds of proposition like Aristotle and the Scholastics, but only three, since they interpret 'Some *S* is *P*' not as 'at least some' but as 'at least some and not all'. Thus the '*I*' in the foregoing table corresponds to the logical product of *I* and *O* in the Scholastic sense. This would give a logical triangle in place of the western logical square.

Also to be noted in the *hetu-cakra* is the evident tendency to extensionalism. That *sapakṣa* and *vipakṣa* are conceived as classes (and apparently by Uddyotakara and Dharmakīrti the subject, *pakṣa*, too) gives the effect of quantification; so that Indian logic was well on the way to extensional thought.

It should finally be emphasized that poor as this logic is, it is none the less formal: these thinkers tried to construct their syllogistic, like Aristotle, out of abstract relationships between classes as such, not out of concrete substitutions.

F. '*Eva*'

Dharmakīrti extended the *trairūpya* by means of '*eva*' which can be applied to either subject or predicate. The formula runs:

In subject *eva*
In *sapakṣa eva*
In *vipakṣa eva* not

Which means:

In subject *wholly*
In similar *only*
In dissimilar *never.*

G. Universal connection

The syllogistic of Dignāga is still very much tied to examples; even he still bears the stamp of the methodological tradition. Liberation from this tradition seems to have been first achieved outside the Buddhist schools, and in the shape of a doctrine of universal connection between reason (*hetu*) and probandum (*sādhya*), or subject (*pakṣa*) and reason. Two varieties of this doctrine are known, one intentional, propounded by a Jaina, Pātrasvāmin (probably 7th century); and one extensional, first clearly in evidence with Kumārila, a Mīmāṃsaka (7th century). The next five passages are the pertinent ones from Pātrasvāmin and the commentary of Kamalaśīla (Buddhist).

> (Text) Can one not already assert the validity of an argumentation is respect of otherwise-non-occurrence (*anyathānupapannatva*)? Thus even reasons having the three marks (*trirūpahetus*) in a syllogism which satisfies these conditions, are powerless, if otherwise-non-occurrence is lacking.
>
> (Commentary) Explanation of the expression 'otherwise-non-occurrence': The expression 'otherwise-non-occurrence' consists of two parts and means that (otherwise: *anyathā*, i.e.) apart from the probandum (*sādhya*) there is no occurrence (*anūpapannatva*) (of the reason): that the reason only occurs in the probandum
>
> (Text) As reason is postulated one to which belongs otherwise-non-occurrence This is a (sufficient) reason whether it is characterized by *one* mark, or by *four*, or *not* by *four*.

The single mark here, is otherwise-non-occurrence, the three others are those postulated by the *trairūpya*.

> (Text) Just as people say of a father that he has *one* son, even though he has three sons, because this son is the only good one, so too this matter is to be understood.

The good son is, of course, otherwise-non-occurrence. Hence:

> (Text) The relation of necessary concomitance is nowhere present in reasons having the three marks (*trirūpahetus*) ... Only those arguments have validity, in which is present otherwise-non-occurrence. The two examples (*dṛṣṭāntas*) may or may not be the case, for they are not the efficient cause (of the conclusion). Where otherwise-non-occurrence is wanting, what use are the three (marks of the *trairūpya*)? When otherwise-non-occurrence is there, (again) what use are the three?

This radical doctrine did not succeed in establishing itself. A similar but more extensional theory, that of *vyāpti*, later became generally accepted. It is not easy to translate '*vyāpti*'; 'pervasion' seems to correspond best with the original sense of the word. A. Kunst uses 'implication', but it must be remembered that there is no question of a relation between two propositions, but either between two classes, or a class and its element (as in Kumārila), or, as for most of the Naiyāyikas, between two properties (essences) in accordance with the intentionalist standpoint of the school. The following text of Kumārila, the first in which we find a definition of *vyāpti*, gives clear expression to the first of these ways of understanding the matter:

> The pervaded (*vyāpya*) is what has equal or less extension in space and time; its pervader (*vyāpaka*) is what has equal or more extension. This means that when the pervaded thing is apprehended, its pervader is apprehended: for not otherwise would the relation of pervaded and pervader hold between the two.

H. Final form of the doctrine

1. *Text*

Passing over the whole vast discussion about *vyāpti* which went on in the Navya-Nyāya from the time of Gaṅgeśa (14th century), we give just one further text, from the *Tarkasaṃgraha* of Annambhaṭṭa (17th century). This small book corresponds closely to the *Summulae Logicales*, only coming at the end instead of the beginning of the development; it contains the essential and generally accepted doctrines of the 'new' Nyāya school.

> Consideration (*parāmarśa*) is the knowledge of the fact that the subject (*pakṣa*) possesses a certain property (*dharma*), (knowledge which is) qualified by *vyāpti*. Example: This mountain has smoke which does not occur without fire – that is the consideration; the knowledge which arises from it (viz.) 'The mountain has fire' is the conclusion.
>
> *Vyāpti* is a law of concomitance (of this type): Everywhere where there is smoke, there is fire.

The quality of being a certain property of the subject (*pakṣa-dharmatā*) is the fact for the 'contained' (i.e. the reason – smoke) of being on the mountain.

There are two kinds of inference (*anumāna*): that for oneself, and that for another. (Inference) for oneself is that which is the cause of the conclusion (drawn) for oneself. Example: As a result of repeated observations in the kitchen etc. one has gained the (knowledge of the) law of concomitance: 'Everywhere where there is smoke, there is fire" (Then) one goes on the mountain and, conceiving a doubt as to whether there is fire on this mountain, when one perceives smoke on it, one remembers the law of concomitance: 'Everywhere where there is smoke, there is fire' From that there arises the knowledge: 'There is smoke on this mountain, which is inseparably associated with fire'. That is what is called the 'consideration of the mark (or middle term). From that there arises the knowledge: 'There is fire on this mountain' as conclusion Such is an inference made for oneself.

But when, having deduced fire from smoke, one uses a five-membered expression to tell someone else, that is inference for another. Example: The mountain is fiery, because smoky. All that is smoky is fiery, like the hearth. So here; therefore it is so. By means of this exposition of the mark, the other also recognizes (that there is) fire

The five members are proposition, reason, example, application, conclusion 'The mountain is fiery' – that is the proposition 'Because smoky' – that is the reason. 'All that is smoky is fiery' – that is the example. 'So here' that is the application. 'Therefore it is so' – that is the conclusion.

2. *Interpretation*

If we disregard the psychology, which here plays a considerable part, these points come to light:

(1) The Indian syllogism is not a thesis, but a rule, like the Stoic and Scholastic syllogisms.
(2) Structurally it is Ockhamist rather than Aristotelian, since the 'reason' always corresponds to a singular proposition.
(3) Yet the formulation rather suggests a formula of modern mathematical logic, than an Ockhamist syllogism, viz.:

For all x: if x is A, then x is B;
but a is A;
therefore a is B.

(4) The Indian formula also contains an express justification of the major premiss. In this respect there seems to be a difference between the classic Nyāya logicians and the *Tarkasaṃgraha*. The latter, and later, text fairly evidently envisages an inductive proof, while the earlier thinkers intuit the connection of two essences in an individual.
(5) It should be evident that we are still in a logic of terms.

Modest as these results may seem to a western logician, the text cited undoubtedly attains to the level of genuine formal logic, though it is very far from being formalistic.

5 SOME OTHER LOGICAL DOCTRINES

In spite of his indifference to logic, even Shcherbatskoy was able to show that later Indian logic contained many interesting doctrines of formal logic. Thanks to the notable study of selected texts from the Navya-Naiyāyikas by D. Ingalls, we are now acquainted with some of them. But Ingalls' book is the first of its kind, and does not yet permit us to survey the whole range of Indian problems. Hence we limit ourselves to brief mention of the most important ones that he considers.

First of all we want to explain the extraordinary appearance of the later Indian logical texts. The first thing that strikes a western reader is the completely negative form of nearly every sentence. In the simplest case, the Navya-Naiyāyikas, instead of writing 'the mountain is smoky' put something like 'not-mountain-ness qualifies the locus of not-being-smoky'. This form seems to have originated in the Buddhist doctrine of *apoha* (exclusion), the consequences of which were taken over by the Navya-Nyāya.

A. Apoha

We read in Dignāga:

> Therefore the meaning of a word consists in a repudiation of the discrepant meaning.

About which a Buddhist commentator, Jinendrabuddhi, says:

> Is the view of a double meaning, really a different view? The mistake found in this view (i e the mistake that it contradicts the text of Dignāga), will not also extend to this (other view)? No, it will not. For the repudiation of the contrary is the exclusive meaning (of every word) And there is no contradiction (with the statement of Dignāga), because the 'own' meaning of the word is just repudiation of the contrary (and nothing else)

A word, then, signifies not what something is, but what it is not. However, this doctrine was not always maintained in its radical sense. E g. Kamalaśīla differentiates three kinds of negation. One of them is defined:

> Simple negation means, e.g., that a cow is not a non-cow

And although Kamaśīla expressly says:

> We have never admitted that the meaning of a word is pure negation.

Still, that 'not not-being-cow' is the pattern of all subsequent logical language.

B. Definitions of Vyāpti

As a first sample of the problems considered in the Navya-Nyāya, we give a text from the *Tattva-cintāmaṇi*, containing five of the definitions of *vyāpti* which Gaṅgeśa rejects. It must be emphasized that this text is one of the simpler ones, and much more readily comprehensible than the commentaries which have attempted to 'elucidate' it.

> What is pervasion (*vyāpti*)? It is not simply non-deviation (of the subject from the probandum, *sādhya*), for it is not this (viz. Non-deviation defined as):
>
> (1) non-occurrence (of the subject) to the locus of absence of the *sādhya*; nor
> (2) non-occurrence to the locus of that absence of the *sādhya*; nor
> (3) the possession of a different locus from that of a mutual absence whose counter-positive is a locus of the *sādhya*; nor

> (4) (the subject's) being the counter-positive of an absence which is in all loci of the absence of the *sādhya*; nor
> (5) non-occurrence in that which is something other than the locus of the *sādhya*;
>
> since if the *sādhya* is wholly positive, *vyāpti* is none of the kinds of non-deviation defined above.

For us to have any understanding of this text – a relatively easy one, be it remembered – the means afforded by mathematical logic are indispensable, and we shall use, in essentials, the symbolism of the *Principia* in its logic of relations. Taking *vyāpti* as inclusion between predicates, we read 'gCs' as 'the relation of *vyāpti* holds between g and s'. The names of the various relations employed in the definitions we abbreviate as follows: occurrence in, absence from, difference from, being in, 'V', 'A', 'D', 'I', being counter-positive of, being locus of 'G', 'L.' Then, neglecting quantifiers, the definitions can be given thus:

1. $g\ C\ s \equiv g\ (\dot{-}V|L|A)\ s$
2. $g\ C\ s \equiv g\ (\dot{-}V|L|A)\ s$ i e. $\equiv g\ (\dot{-}V|L|V|L|D)\ s$
3. $g\ C\ s \equiv g\ (L|D|G|L)\ s$
4. $g\ C\ s \equiv g\ (G|A|I|L|A)\ s$
5. $g\ C\ s \equiv g\ (\dot{-}V|D|L)\ s$

Prefixing universal quantifiers to these equivalences, we get the abbreviated formulae:

1. $C = \dot{-}V|L|A$
2. $C = \dot{-}V|L|V|L|D$
3. $C = L|D|G|L$
4. $C = G|A|I|L|A$
5. $C = \dot{-}V|D|L$

The degree of abstraction is evidently very high. The formulae can be further simplified if one takes I, L and V as simple inherence, D and G as non-identity, A as the negation of inherence; then the first definition, for example, could be read:

1. $g\ C\ s \equiv .\ (x) \sim (gx\ .\ \sim sx)$,

which by a well known equivalence yields:

$$\equiv .\ (x)\ gx \supset sx$$

a formal implication. Such a simplification, however, would be a violation of the text, since the Navya-nyāya logicians distinguished all these relations sharply, but the reduction we have made does show that they were concerned with essentially the same problem as the Megarians, Scholastics and now again the moderns, the problem of defining 'if, then'.

While we shall not go further into the widely different positions adopted about this matter, it may be remarked that Gaṅgeśa formulates in this text only a few of the definitions of *vyāpti* that were current in India; according to the *Nyāya-kośa* 13 correct and 21 incorrect ones had been given.

C. Some basic concepts

We now confine ourselves to the enumeration of some basic concepts of the Navya-nyāya, and in dependence on Ingalls. We choose the following points:

The Navya-nyāya regularly operates with a twofold abstraction: first, from a concrete object, say a man, *devadatta*, devadatta-ness was abstracted; from this in turn a further abstraction was made, yielding what it is to be devadatta-ness, or devadatta-ness-ness. The same abstractions were regularly applied to relations. With the help of such concepts the Indian logicians were able to express very complicated matters in a purely intentional way, without any use of quantifiers.

The Navya-nyāya has a whole series of concepts corresponding to the western subject and predicate, or argument and functor. One such pair, which seems to be basic, is locus (*adhikaraṇa*) and superstratum (*ādheya*); but the superstratum can have a threefold relationship to the locus, being in it by inherence, contact or particular determination.

Another pair is that of the determinandum and the determinans (*viśeṣya* and *viśeṣaṇa*). The determinandum seems to be a concrete object, the determinans a property, whether a specific (*jāti*) or 'imposed' property (*upādhi*) – we may compare the Aristotelian concepts of species and accident.

A third pair is that of the limitor and the limited (*avacchedaka* and *avacchinna*). Among various meanings, this is fundamental: if a concrete *A* is determined by a property *B*, then the abstract of *B* is limited by the abstract of *A*. E.g., take 'the mountain has fire'; then the mountain is determined both by mountainness and fieriness; it is then said that it is determined by fieriness limited by mountainness.

As to identity, the Navya logicians seem not to have had a technical term for our *numerical* identity in Aristotle's sense. Instead, they always used specific identity for which they had at least three synonyms: (1) *A* has the same nature as *B* (*A B-svarūpa*); this was called 'essential identity' (*tat-svarūpatā*); (2) *A* has self-identity with *B* (*A B-tādātmya*); (3) *A* is precisely *B* (*A B eva*).

In the matter of negation, Gaṅgeśa already has a whole series of concepts. Two classes of such concepts can be distinguished among the later logicians:

(1) mutual absence (*anyonyābhāva*), consisting in the denial of identity, e.g. 'fire is the locus of absence of water'; this negation was also expressed by 'is different from' (*bhinna*).
(2) Relative absence (*saṃsargābhāva*), denial of a relation other than identity, e.g. 'the lake has absence of fire' where contact is the relation denied. There are various sub-classes of relational absence, of which permanent absence (*atyantābhāva*) is the most important.

This line of thought is further complicated in that our logicians regularly speak of an opposite, (*abhāvīya-pratiyogi*) which they apparently conceive of as an object, and a concrete one, so that they are able to form an abstract from it, and limit this, and so on. If now the opposed-ness of absence is limited by a specific property, the resulting absence is called specific absence (*sāmānyābhāva*), but if by an individual property, an individual absence (*viśeṣābhāva*). The following gives an example of specific absence:

> A lake is a locus of constant absence of fire, the opposedness to which is limited by fieriness and contact.

This means that the relation of contact does not exist between lakes and fieriness.

By speaking not of fire but of fieriness in such formulae, the Nāvya-Nyāya can express what western logic tries to express by a quantified formula, in our case, by saying: 'There is no fire in a lake'. The Nāvya-Nyāya logic is thoroughly intentional, in a way often sought after in the west, but never achieved.

In connection with different kinds of negation, there was a vast discussion about what corresponds to the western law of double negation. A sample of this discussion follows.

D. The law of double negation

In the light of the fore-going, the next text, even if not thoroughly comprehensible, at least enables one to guess at its meaning. We read in Mathurānātha:

> (The above objection should not be made,) for this reason: Absence of a constant absence is essentially identical with the counter-positive (of the constant absence). Therefore, difference from pot is essentially identical with an absence the counter-positiveness to which is limited by counter-absence of difference from pot Therefore even pot-ness, although it is the limitor of counter-positiveness to difference from pot, in so far as it is essentially identical with constant absence of difference from pot, is still the counter-positive itself of difference from pot and subsists by inherence.
>
> The following theory should not be held: Although in other cases absence of constant absence is essentially identical with the counter-positive (to the constant absence), still an absence limited by constant absence of difference from pot etc. is not essentially identical with difference from pot etc., but is only essentially identical with constant absence of pot-ness....

The logician expresses his opinion about that as follows:

> Such a theory cannot be upheld, for wherever one perceives a pot, there one does not perceive constant absence of a pot, and there one may say there is absence of constant absence of a pot. Accordingly absence of constant absence of pot is essentially identical with pot.

The last sentence expressly formulates the law of double negation. Mathurānātha goes on:

> In just the same way, wherever one perceives difference from pot, there one does not perceive constant absence of difference from pot, and there one may say there is absence of constant absence of difference from pot. Accordingly, an absence the counter-positiveness to which is limited by constant absence of difference from pot is simply different from pot.

That is to say, not from pot-ness. Here we even have something like a law of triple negation. But it should be noticed that not all these negations are of the same kind.

E. Relational logic, definition of number

The foregoing gives only a sample of the range of problems considered by the Nāvya-Nyāya. They include also various questions about the logical sum and product, obscured in their syntax by the difficulty of being sure in Sanskrit whether expressions are to be taken as sentences or terms. We shall not explore them further. The logic of relations is also elaborated, or rather a doctrine about kinds of relation and relational abstracts. Of special interest is the relation called '*paryāpti*' (*paryāpti-sambandha*), about which Mathurānātha writes:

> But still, if one admits the theory that two-ness is related by *paryāpti* to two and not to each, the definition will be so wide as to apply in false inference where the reason occurs by *paryāpti*, e.g., 'It is a pot because it is both a pot and a cloth'. Here the reason, pot-and-cloth-ness, does not occur in the locus of not-potness by *paryāpti*, which is the limiting relation of being-reason, for common sense tells us that just as 'pot' (i.e. locus of potness) is not 'both pot and cloth', so 'locus of not-potness' is not 'both pot and cloth'.

The essential point here for us, is not the discussion about the rightness of the inference in question, but the description of *paryāpti*, which is a relation between the number 2 and a class with two elements, not between the latter and its individuals. This resembles Frege's definition of number.

SUMMARY

In spite of our insufficient knowledge of Indian logic, we can say in summary:

1. In India too a *formal logic* developed, and so far is known, without the influence of Greek logic. That it really was a formal logic is shown by the fact that the formulae constructed by the Indian thinkers concern the fundamental question of logic, the question of 'what follows from what'. These formulae, moreover, were thought of as universally valid.
2. But it is quite a *different variety* of logic to that we are accustomed to in the west. There are two great differences; Indian logic has *no variables*, and its tendency is *notably intentional*, whereas western logic is predominantly extensional.
3. This intentional tendency led to an extremely interesting range of problems, not yet wholly comprehensible to us, and to a logical

analysis of quite a different kind to the developed in the west. This is most evident in the formulation of very complicated matters *without quantifiers*, also in the strange doctrine *of repeated abstraction*, and so on.

4. Indian logic seems to be almost entirely lacking in *propositional logic*; its logic of classes and predicates roughly corresponds to syllogistic, while remaining more rudimentary than the latter. On the other hand it has a very interesting and subtle doctrine of *formal implication*, a remarkably abstract and complex *theory of negation*, and some theorems in the domain of *relational logic* such as did not develop in the west till Frege and Russell.
5. In the present state of research it is difficult to attempt comparison with the western varieties of logic The general impression is that while important problems of formal logic were unknown to the Indians e.g. antinomies, truth-tables, yet in some matters they attained the heights of logical subtlety and abstract treatment, to such a degree that the west could learn a great deal from them, granted more thorough research and more adequate interpretation.
6. But the most interesting thing about this variety of logic is that in quite different circumstances and without being influenced by the west, it developed in many respects the *same problems* and reached the *same solutions*. Examples are the syllogism of the *Tarka-Saṃgraha* and Mathurānātha's definition of number.

Once more then, it can be said that we meet here an original and interesting variety of genuine formal logic.

NOTES

1 I.e. among the followers of the Nyāya. The most important of other such names are 'Mimāṃsaka' for a follower of the Mimāṃsā, 'Vedāntin' for a follower of the Vedānta, but simply 'Vaiśeṣika' for a follower of the Vaiśeṣika.

2 According to Shcherbatskoy, Vatsyāyana might possibly be a contemporary of Dignāga's, but D. Ingalls puts him in the 4th century (communication by letter).

3 This thinker has been generally ascribed to the 9th century, but I follow P. Hacker who puts him in the 10th. Prof. D. Ingalls was kind enough to draw my attention to Hacker's work.

4 Prof. D. Ingalls has remarked on this.

5 Prof. C. Regamey has helped greatly in drawing up this table. For examination of the technical terms, cf. Randle

Chapter 8

The Concept of *Pakṣa* in Indian Logic

J. F. Staal

In studying a civilization different from out own we are prone to impose the conceptual framework and prejudices of our own tradition. The study of Indian logic by Western scholars, including Indian scholars who accepted certain tenets of Western logic, forms no exception S. C. Vidyabhusana, the first historian of Indian logic, looked at his subject through eyes so coloured by what he regarded as Aristotelian logic, that he talked of the 'Indian syllogism' and saw in it traces of the influence of Aristotle – a historical claim no serious student of Indian logic would nowadays wish to make his own. Moreover, like many other scholars of his generation, Vidyabhusana was not really familiar with Aristotle, but rather with what is generally called 'traditional logic', a mixture extracted from Aristotle, but enriched with the left-overs of numerous other dishes. A decade later, the great Russian pioneer of the study of Buddhist logic, Th. Stcherbatsky, adopted a Kantian framework and introduced thereby even greater confusion. For unlike Aristotle, who doubtless continues to be the greatest logician in the Western tradition, Kant was no logician, and the weaknesses of his philosophy are due precisely to his ignorance of logic.

I present these remarks by way of introduction, but they should not be regarded merely as historical anecdotes. For the prejudices of Vidyabhusana and Stcherbatsky continue to affect our understanding of Indian logic. This is clear from the literature in Western languages even on such elementary notions as the concept of *pakṣa*. This particular notion is furthermore obscured by the fact, that the term *pakṣa* is within Indian logic itself not used unambiguously. And so we witness the growth of a dense jungle of scholarship – first in Sanskrit,

and next in Western languages – due to confusions around a notion that is basic and quite elementary. This paper attempts to clear some parts of that jungle.

There is no point in criticizing theories unless it is from the perspective of what one regards as the correct theory. Similarly, in order to appreciate precisely where and how some interpretations have gone wrong, we have to know the right interpretation first. I shall therefore begin by elucidating the most important and most technical meaning of the term *pakṣa* in Indian logic, which occurs throughout its development, Hindu as well as Buddhist, and which is in fact straightforward and simple. In Indian logic, entities are never considered as if they were hanging in the air, but always as occurring in a locus (*āśraya; ādhāra; adhikaraṇa*). In this sense, Indian logic has its feet firmly on the ground. This ground, in the case of any specific case of inference, is called its *pakṣa*.

In order to explain this a little more precisely I shall make use of formal expressions, thereby perhaps inviting the accusation that I am imposing on the Indian material a framework of modern mathematical logic, thus merely substituting a more fashionable bias for the Aristotelian and Kantian prejudices of my predecessors. But this in fact is not the case. I use symbols merely because they are more precise and unambiguous than ordinary English. By introducing them I do not import any notions, theorems, or theories of contemporary Western logic.

In Indian logic, an entity, say x, is never regarded in isolation, but always considered as occurring in a locus, say y. The fundamental relation which underlies all expressions is therefore the relation which obtains between each entity and its locus. Since such a relation relates x to y, it is a two-place relation, which may therefore be written as:

(1) $A(x, y)$

This may be read as: 'x occurs in y', or, alternatively, as 'y is locus of x'. The relation A may be called an occurrence relation.

Given such relations, an inference is not merely a relationship between two entities, but a relationship between two entities as occurring in a locus. It would therefore be incorrect, or at least a rather rough approximation, to express the relationship between h, the *hetu* 'reason' and s, the *sādhya* "thing-to-be-inferred, inferendum"[1], as:

(2) $h \rightarrow s$.

It is more appropriate to express the relation of inference as a relation between two occurrence relations of the type (1), i.e., as:

(3) $A(h, p) \rightarrow A(s, p)$.

This may be read as follows: 'if the *hetu* occurs in p, then the *sādhya* occurs in p'. Here the particular locus p in which the particular inference between h and s occurs, is what is called the *pakṣa*. In the stock example, the *hetu* is smoke, the *sādhya* is fire, and the *pakṣa* is a mountain. On this interpretation, (3) may be read as: 'if smoke occurs on a mountain, then fire occurs on that mountain'.

Part of the later history of Indian logic is the attempt to generalize expressions of this form in such a way, that they hold not only for a specific *pakṣa*, but for all loci. What is then attempted is to arrive at expressions equivalent to:

(4) $(x)\ (A\ (h, x) \rightarrow A\ (s, x))$,

which may be read as: 'for all x, if h occurs in x, then s occurs in x'; or: 's occurs whenever h occurs' (cf. Staal, 1962). I am not concerned with these later developments (treated in *navya-nyāya* in some of the commentaries upon the section called *pakṣatā* of the *Tattvacintāmaṇi*), but shall confine myself to the original notion of *pakṣa* itself.

Vidyabhusana interpreted the notions of *pakṣa*, *hetu* and *sādhya* in terms of traditional logic as minor term, middle term and major term respectively (e.g., Vidyabhusana, 1921, pp. 176, 312). In order to see to what extent this is correct we shall have to go back to Aristotle (cf. Bocheński, 1951, pp. 42–46). Aristotle considered primarily sentences of the form 'x belongs to y', which may be symbolized as:

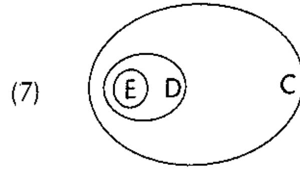
(5) $B\ (x, y)$.

A syllogism then consists of two premisses of the form (5) from which one conclusion again of the form (5) is derived. Different types of syllogism are obtained by substituting for 'x' and 'y' in the premisses and in the conclusion three terms: one in one of the premisses and in the conclusion; another in the other premiss and in the conclusion; and a third in both premisses. The third term is called 'the middle'; the other two, 'the extremities'. The following is an example, where D is the middle term, and C and E are the extremities:

$$(6)\quad \begin{array}{l} B\ (C, \text{all } D) \\ \underline{B\ (D, \text{all } E)} \\ B\ (C, \text{all } E) \end{array}$$

or: 'if C belongs to all *D*, and *D* belongs to all *E*, then C belongs to all *E*'.

Of the extremities, one is called the minor term and the other is called the major term These terms, however, are not defined according to their formal position in syllogisms of the form (6); rather, they are defined, at least for the first figure[2], according to their *extension*. What this means is best seen when (6) is illustrated as follows:

(7) 

Here, *E*, which has the smallest extension, is the minor term; and *C*, which has the largest extension, is the major term.

We are now in a position to return to Indian logic. It is obvious why Vidyabhusana thought that the *hetu* corresponds to the middle term: neither the *hetu*, nor the middle term occurs in the conclusion of the inference. That is to say, the *hetu* does not occur on the right side of (3), i.e., in:

(8) $A\ (s, p)$,

and the middle term does not occur in the conclusion of (6), i.e., in:

(9) B (*C*, all *E*).

It is also clear why he thought that the *pakṣa* and the *sādhya* correspond to the minor term and the major term, respectively: for (8) or 'the *sādhya* occurs in the *pakṣa*' looks somewhat like (9) which seems to express: 'the major term belongs to all the minor term'.

But if we look a little more closely here, we discover that these interpretations are nothing but the results of a confused muddle. In the Aristotelian syllogism, there are two premisses and one conclusion, and all three are of the same form, i.e., (5). In the Indian inference, on the other hand, there is only one premiss, viz., $A\ (h, p)$, and the two relations from the *hetu* to the *pakṣa* and from the *sādhya* to the *pakṣa* are always the same relation, namely the occurrence relation *A*. There is an entirely superficial and fortuitous similarity between the particular syllogism illustrated in (6), and the general form of the Indian inference, viz., (3). The three terms in Aristotelian logic, and in the traditional logic which is derived from it, are all of the same

category. The Indian *pakṣa*, on the other hand, is an entirely different kind of thing from the *hetu* and the *sādhya*: it is the particular locus in which both the *hetu* and the *sādhya* happen to occur; it plays no part in the inference itself, though it is inseparable from each of its two terms. The *pakṣa* is the locus where the *hetu* occurs, and where the occurrence of the *sādhya* is doubled and sought to be established.

The difference may also be formulated thus. In Aristotle's syllogism the three terms are always related to each other through a relation of the form $B\ (x, y)$ or '*x* belongs to *y*'. In the Indian syllogism there are two terms, *h* and *s*, which are always related to each other through the relation of *pervasion*; both *h* and *s* are in addition related to the locus *p* but only through the occurrence relation *A*.

Vidyabhusana's erroneous identifications and comparisons have been repeated or relied on by almost all later interpreters of Indian logic. Stcherbatsky entangles them even further in his *Buddhist Logic*, but this deserves separate treatment, and I shall return to it. Some scholars confine themselves to using the terms 'minor', 'middle' and 'major' for the three Indian terms, without referring to the function which these former terms have in Western logic (e.g., Athalye, 1930, p. 281; Kuppuswami Sastri, 1932, pp. 188–189; Bocheński, 1956, pp. 497, 501; Goekoop, 1967, pp. 11–12, 56; Matilal, 1971, pp. 128–129). Others go out of their way to relate the Indian and the Aristotelian systems, and get wrapped up in greater confusions (e.g., Foucher, 1949, pp. 117–118; Barlingay, 1965, p. 109). The only scholar I have found who seems to have had an inkling that these comparisons do not hold water, is Ingalls (1951, p. 35): though he uses the Western terms when introducing the Sanskrit ones, he remarks in a footnote: "Since the relation between *s* and *h* is one of pervasion, *h* may be equal to *s*.... In such cases, it is only by an extension of the literal meanings that one can speak of 'major', 'middle' and 'minor' terms. This is one reason why I prefer to keep the Sanskrit names, '*s*', '*h*', and '*p*'" (*ibid.*, note 28). But the assumption underlying this observation is incorrect: Aristotle does consider cases where the middle and major terms are equal[3].

Turning now to Stcherbatsky we meet with a weird mixture that seems to have nothing whatsoever to do with logic. Though Stcherbatsky's translations are on the whole quite literal and reliable, his interpretations and explanations are often extremely confused and almost always unclear. The Indian distinction between *svārthānumāna* 'inference for one's own sake' and *parāthānumāna* 'inference for the sake of others' is expressed and interpreted by Stcherbatsky by calling

the second kind of inference, but not the first, 'syllogism'. Stcherbatsky is of course well aware of the Aristotelian and traditional connotations of that term In fact, he says: "We have given the name of Syllogism to inference 'for others' because of its outward similarity with Aristotle's First Figure" (I 278; the other figures need not detain us, he says, they are 'false subtlety' anyway: I 309). As a result, chapter II of part III, which explains inference, is relatively free from Aristotelian (though not from Kantian) bias. But chapter III of part III, which deals with 'syllogism', though clearly enunciating one of its basic characteristics ("It thus consists of a general rule and its application to an individual case": I 279), uses the expressions minor, middle and major in a very confusing manner, applying 'minor' and 'major', as in traditional logic, to premisses as well as to terms

The second volume of Stcherbatsky's *Buddhist Logic* contains the translation of Dharmakīrti's *Nyāyabindu*. In the translation of the third *pariccheda*, which deals with the *parāthānumāna* 'syllogism', many inferences are interpreted in terms of a major premiss, an example, a minor premiss and a conclusion. Though this forces the meanings of the original expressions into a very badly fitting straight-jacket, I shall confine myself to the treatment given to the concept of *pakṣa*. When this concept is introduced in the second *pariccheda*, Dharmakīrti does not refer to it by the term *pakṣa*, but by its predecessor, the term *anumeya*. Stcherbatsky translates the latter term as 'the object cognized by inference' and identifies it with the minor. In the section entitled 'Minor term', he translates the definition of *anumeya* (*anumeyo'tra jijñāsitaviśeṣo dharmī*) correctly as: "The object cognized in inference is here the substratum whose property it is desired to cognize." The term 'substratum' (*dharmin*) refers here to the locus, which has for its property (*dharma*) or specification (*viśeṣa*) the *sādhya* which occurs in it, so that the relation:

(8) *A* (*sādhya, anumeya*)

holds.

Now it is clear that the expression (8) refers itself to the conclusion of the inference. The commentary of Dharmottara on this definition reveals a certain ambiguity of the term *anumeya* as used in this context. In Stcherbatsky's translation: "The word *here* means that the object of inference appears as a substance (a substratum) when the definition of its mark is considered (the mark being an attribute of this substance). But from another standpoint, when the deduced (conclusion) is

realised, the subject of the inference would be a complex (idea of the substratum together with its property). And when the invariable concomitance (between the middle and the major terms) is considered, then the inferred fact appears as an attribute (of this substance, as the major term). In order to point out (these differences) the word *here* has been used. We call *object of inference* an object whose property, or specification, it is desired to cognize" (II 58) (*atra hetulakṣaṇe niścetavye dharmy anumeyaḥ / anyatra tu sādhyaprati-pattikāle samudāyo'numeyaḥ / vyāptiniścayakāle tu dharmo'numeya iti darśayitum atra grahaṇam / jijñāsito jñātum iṣṭo viśeṣo dharmo yasya dharmiṇaḥ sa tathoktaḥ)*.

Stcherbatsky attaches a footnote explaining *anumeya*: "In a general sense it may mean an object which possesses the united properties of the major, the minor and the middle terms, e.g., 'the mortal man Socrates'; it is then *ekam vijñānam*. It may also mean the major term or the conclusion separately, as well as the thesis which is also the conclusion (= *pakṣa* = *sādhya*). In a special sense it means the minor term, the subject of the conclusion, and even more precisely, the underlying substratum (*dharmin*), the efficient point-instant, that underlying point of reality upon which any amount of interconnected qualities may be assembled as a superstructure" (*ibid.*, note 1).

Such muddles do not help the understanding of Indian logic. In fact, no logician who reads them can fail to lose whatever regard he might ever have had for that subject. And yet, Stcherbatsky was partly correct in his interpretations The confusion is partly due to the Indian logicians themselves, and the rest results from imposing upon their expressions an Aristotelian framework that has nothing to do with it. The ensuing jumble may be sorted out and clarified along the following lines.

As we have seen, the conclusion of an Indian inference may be expressed by $A(s, p)$ (8). Now Dharmottara referred to three things that may be called *anumeya* in this conclusion because each of them may be used to express what it is that is concluded: the *dharmin* p, which has s for its property: the *dharma* s, which p has for its property; and the complex (*samudāya*) of the *dharmin* together with its *dharma* The reason for this undecidedness is that the Buddhist logicians failed in this context to properly express that the conclusion is the *relation* $A(s, p)$: they confined themselves to expressions denoting terms and 'complexes' of terms. Stcherbatsky compounded this error by imposing the Aristotelian framework he had adopted, and so came to speak of a term in the inference which may be either

the major or the minor – as if such a terminology should ever be introduced for any other reason than in order to distinguish between the two. The two facts that the terms *sādhya* and *pakṣa* are used by Indian logicians in such a way that either of them can be used to state the conclusion, and that this was done without the entire edifice falling to pieces, should have alerted Stcherbatsky that these terms could not possibly denote the same concepts as the Aristotelian major and minor terms.

Though the Buddhist logicians did not clearly express the relational character of the conclusion of the inference in the contexts in which they introduced and discussed terms such as *hetu*, *sādhya* and *pakṣa*, they did so in other contexts. But to confuse matters again, they there refer to this relation by the term *pakṣa*. Accordingly, *pakṣa* refers sometimes to p, and sometimes to $A(s, p)$. This is not as strange as it may seem, though it is certainly bad logic. The occasional confusion between a term and a sentence is not uncommon in Indian logic, and it is undoubtedly related to the structure of the Sanskrit language, where a certain type of expression can either refer to a noun or to a sentence (cf. Staal, 1965, p. 181; 1971, p. 200). Thus, *parvato vahnimān* can mean either 'the mountain possesses fire' or 'the mountain which possesses fire'; and this may depend on the context. A more accurate way of expressing the fact that the term *pakṣa* is ambiguous in this way, is by saying that it refers either to $A(s, p)$, or to $\iota pA(s, p)$, which may be read as: 'that p such that $A(s, p)$' (rather than just p).

Stcherbatsky does not explicitly refer to this distinction, but he implicitly distinguished between the two meanings by translating *pakṣa* sometimes as *subject* (or similar terms, in the contexts already referred to) and sometimes as *thesis*. The latter translation is adopted in II 153 and following, where he deals with the definition of *pakṣa* in the *Nyāyabindu*. Later scholars have felt this same ambiguity. For example, Tachikawa writes in the notes to his excellent translation of the *Nyāyapraveśa*: "According to the definition given by Śaṅkarasvāmin, the *pakṣa* is an object which the arguer wishes to prove to be qualified by a property, not the statement of the form: A property-possessor is qualified by a property. The statements, however, are here taken as examples of the *pakṣa*, which seems to indicate some laxity in the usage of the term *pakṣa*" (Tachikawa, 1971, 132, note 9).[4]

The *Nyāyapraveśa* of Śaṅkarasvāmin contains yet another use of *pakṣa*, interesting especially because the ambiguity of the Sanskrit original is resolved in the Chinese translation. Tachikawa renders the

relevant passages correctly but has to resort to rather free translations. In these contexts, the term *pakṣa* refers to what the *sapakṣa* and the *vipakṣa* have in common. This can of course be said to be *pakṣa* from a morphological point of view, if the terms are taken to be mentioned, not used. But the meaning of the term which is thus constructed does not correspond to that more common meanings of the term *pakṣa* in Indian logic. In fact, what *sapakṣa* and *vipakṣa* is defined as any locus, different from the *pakṣa*, where the *sādhya* occurs; and *vipakṣa* as any locus where the *sādhya* does not occur (see Staal, 1962, 634–635).

This special sense of *pakṣa* occurs first in the discussion of a reason (*hetu*) which is fallacious because it is common to both the *sapakṣa* and the *vipakṣa*. An example is: 'sound is permanent because it is an object of valid cognition' (*śabdaḥ prameyatvān nityaḥ*: Tachikawa, 1971, 124, 142). Here the *hetu* is fallacious 'because the property of being an object of valid cognition is common to both permanent and impermanent things' (*nityānityapakṣayoḥ sādhāraṇatvād*). In other words, since both permanent and impermanent things can be known (everything can be known in the Nyāya view), it is not proper to conclude that sound is permanent from the fact that it can be known.

The Chinese translators render *sapakṣa* and *vipakṣa* each by a combination of two characters. The two pairs have one character in common, which is however different from the character used to translate *pakṣa*. this particular structure enables the Chinese translators to avoid the ambiguity of the Sanskrit original. Thus in Hsüan Tsang's translation of the *Nyāyapraveśa*, entitled 因明入正理論 (*Yin ming ju cheng li lun*: T, 1630, Vol. 32, 11a ff.), *pakṣa* is rendered by 宗 *sapakṣa* by 同品 and *vipakṣa* by 異品. But in the above passage, translated 常無常品皆共此因 (T. 1630, 11c: 20), the term *pakṣa* is rendered by 品, the character which the expressions for the *sapakṣa* and the *vipakṣa* have in common.

Thus the Chinese translation avoids the confusing ambiguity of the original and expresses its logical structure more adequately. This should come as a surprise to those who maintain that the Chinese translators did not appreciate the subtler points of the Sanskrit originals, but merely replaced words by characters in a mechanical manner, the results being fit for recitation and perhaps meditation, but not susceptible to further rational analysis. In this instance, at least, Hsüan Tsang's translation is decidedly superior to many of the modern translations I have been concerned with in the above attempt to clear some of the interpretative jungle that surrounds the concept of *pakṣa* in Indian logic.[5]

NOTES

1 The translation 'inferendum' was suggested to me by Mr. Paul Z. Panish.

2 Aristotle gives different definitions in different contexts, and the definitions given for the first figure do not apply to the others. See Łukasiewicz (1957) pp. 28–82 and Patzig (1959) = Patzig (1968), Chapter IV.

3 In *An. pr.* B5, 75b 35 ff. And in *An. Post.* A3, 73a 6ff., Aristotle considers arguments where all three terms are convertible with each other, which is at least as strong a claim as that of extensional equality.

4 The same 'laxity' is present when Tachikawa takes *pakṣa* to be the sense of *sādhya in anitye śabde sādhye* (Tachikawa, 1971, p. 132, note 9).

5 I am very grateful to Professor Lewis R. Lancaster with whom I taught a seminar on the *Nyāyapraveśa* and who initiated me into the intricacies of its Chinese translation, and to Professor Michael Frede who improved my account of Aristotle's logic and provided the references in note 3.

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Chapter 9

Some Aspects of the Navya-Nyāya Theory of Inference

Sibajiban Bhattacharyya

Navya-Nyāya (The New Logic) originated in the writings of Gangeśa Upādhyāya (circa 13th century), and was developed during the 16th to 18th centuries by Raghunātha Śiromaṇi, Mathurānātha Tarkavāgīśa, Jagadīśa Tarkālaṅkāra, Gadādhara Bhattāchāryya, and many others. In this chapter we shall explain some features of the theory of inference developed by these logicians. We shall compare and contrast the Navya-Nyāya theory of inference with the traditional syllogism, Aristotelian syllogism, and sometimes with the theories of modern symbolic logicians.

1 TRADITIONAL WESTERN SYLLOGISM

We note the following points. A standard example of a traditional syllogism is the following:

Inf. 1. (i) All men are mortal
(ii) Socrates is a man.
(iii) ∴ Socrates is mortal.

Every syllogism consists of three sentences, and three (different) terms. The sentences must be in their logical form, i.e., they must exhibit a subject, a predicate and a copula which is not a part either of the subject or of the predicate. In this tripartite division of a sentence in its logical form, the copula has the following characteristics:

(a) It must be a form of the verb 'be'
(b) It must be in the present tense.

(c) It may be either affirmative or negative.

If we have an inference like

Inf. 2. (i) All cats like milk.
(ii) Pussy is a cat.
(iii) ∴ Pussy likes milk,

we must reduce the sentences (i) and (iii) to their logical form to get the following syllogism:

Inf. 2A. (i) All cats are those which like milk.
(ii) Pussy is a cat.
(ii) ∴ Pussy is that which likes milk.

The three terms of a syllogism, the major, the middle and the minor, are the subjects and predicates of the sentences reduced to their logical form.

2 NAVYA-NYĀYA INFERENCE

Inference is a form of mediate knowledge of knowing something by knowing something else. We first show, as literally as possible, how an inference as a process of knowing is expressed in Sanskrit. We shall need to show two forms of expressions stating an inference. A stock example of the first form is:

Inf. N-N 1. (The) hill (is) fire-possessing,
because of smoke.

(In Sanskrit there are no articles, definite or indefinite, and the verb 'be' is usually omitted; hence we show them in parentheses.)
The sentence

(a) (The) hill (is) fire-possessing

expresses the *conclusion*;
the expression

(b) because of smoke

states the *reason* or the *probans* (*hetu*, abbreviated *h*) of the inference.
From the conclusion two terms are determined, (i) the *locus* of the inference (*pakṣa, p*) which is the first term of the conclusion, corresponding to the minor term of the traditional Western syllogism; and (ii) the *probandum* of the inference (*sādhya, s*) which is the

second term of the conclusion roughly corresponding to the major term of the traditional Western syllogism. There is no problem in determining p and h of an inference; they are explicitly stated. p is what is denoted by the first term of the sentence stating the conclusion ((a) above), and h is what is denoted by the expression coming after 'because of' in (b). In Inf. N-N I, p is (the) hill (not 'hill'), and h is smoke. But there is a problem in the case of s, for it is not explicitly stated. To understand this problem we have to consider another type of inference. An example is the following:

Inf. N-N 2. This (is) fire
Because of heat.

Here the sentence

(a) This (is) fire

expresses the conclusion;
and the expression

(b) because of heat

states the h.

It is important to note the difference between Inf. N-N 1 and Inf. N-N 2. In the former there is a suffix '-possessing' added to the word 'fire', whereas in the latter this suffix is absent. For determining s of an inference, Navya-Nyāya gives the following rule of thumb:

Rule N-N 1 To determine s of an inference, (i) drop the suffix '-possessing' when it occurs in the second term of the sentence stating the conclusion; (ii) add the suffix '-ness' to it when the suffix '-possessing' does not occur

Explanation In Inf N-N 1, in the verbal expression of the conclusion, the second term is 'fire-possessing'; to determine the s of this inference, the rule says that we have to *drop* this suffix; so we get the word 'fire'. The s is what is denoted by the word 'fire', i.e., fire (not the word 'fire')

In Inf N-N 2, the second term of the conclusion-sentence is 'fire' which does not have the suffix '-possessing'. To determine the s of this inference, the rule says that we have to *add* the suffix '-ness' to this word. Thus we get the word 'fire-ness'. The s is what the word 'fire-ness' stands for, i.e., *the property of being a fire*, neither fire, nor the word 'fire-ness'

Thus the three terms of Inf. N-N 1 are (i) s – fire; (ii) h – smoke; (iii) p – (the) hill.

The three terms of Inf. N-N 2 are: (i) s – fire-ness, (ii) h – heat, and (iii) p – the thing pointed to, denoted by 'this'

Thus although the concept of *copula* is absent in Indian logic, still if the tripartite division of sentences into subject, predicate and copula is accepted, then Rule N-N 1 has the effect of making the verb 'possess' or 'have' the copula.

Western scholars writing on Navya-Nyāya are often unaware of Rule N-N 1, and commit the mistake of regarding fire-possessing as the s of Inf. N-N 1. Karl H. Potter, for example, writes in his recent work (Potter 1977), 'The property which is proved to qualify p is the *sādhya* or s. In the above argument s is fire-possessing' (*ibid.*, p. 181). In his earlier book (Potter 1963), Potter has analysed Navya-Nyāya inferences in another way. 'The class which functions as fire-possessing does in this inference . . . is called in Sanskrit the *sādhya* or thing to be proved .... Any class which functions as smoke-possessing does in the stock inference .... is called the *hetu*' (ibid., p. 60). Here Potter commits three mistakes. (i) He thinks that the *sādhya* or s is to be determined from the term 'fire-possessing'. (ii) Similarly, he thinks that the h is to be determined from the term 'smoke-possessing'. It is curious that he should commit this mistake, for we have already seen that in Sanskrit the inference is stated as in Inf. N-N 1, where the h is explicitly stated. Potter, therefore, changes it to read:

Inf. N-N 1 POT. The hill is fire-possessing, because it is smoke-possessing

and then determines the s and the h from the *predicates in the traditional Western sense*, namely, 'fire-possessing' and 'smoke-possessing'. (iii) Potter identifies not fire-possessing and smoke-possessing (which are denoted by the terms 'fire-possessing' and 'smoke-possessing') with the s and h of Inf. N-N 1, but identifies the *class* of fire-possessing and the *class* of smoke-possessing things as the s and the h. he confuses here the s with the class of *things which possess s*, i.e., *the class of all* (and only) *loci of s*; similarly, he confuses h with *the class of all loci of h*.

We end this section by pointing out a mistake which Professor J. F. Staal makes in presenting an example of Navya-Nyāya inference. He says, 'Logicians express "since the pot is blue, the flowers look beautiful" by an expression which may be literally rendered by

something like "because of pot-blueness the flowers are beautiful"' (1960). But the expression 'because of pot-blueness the flowers are beautiful' cannot express any inference. In an inference, there is an *h* which is related to both *s* and *p*, such that a relation between s and p is established. But the sentences,

The pots are blue
The flowers are beautiful

show that there are 4 different terms, so that the terms 'flowers' and 'beautiful' are not related to a third term. Thus this is not even an instance of the traditional Western syllogism. To express an inference that is intended here, we have to say, 'the flowers look beautiful, because of being placed in blue pots' where the *s*, the property of looking beautiful, the *h*, the property of being placed in blue pots, and the *p*, the flowers, are all related in the proper manner.

3 EXPRESSING NAVYA-NYĀYA INFERENCES IN ENGLISH

We now propose a way of expressing in English inferences like Inf. N-N 1–2, so that what Rule N-N 1 says becomes evident. The proposal consists essentially in stating inferences of Navya-Nyāya in the manner of traditional Western syllogism; for even though Navya-Nyāya logicians state only the conclusion and the reason, when discussing inference as a process of knowing, other things have to be *understood*. We shall state these unstated things in two stages.

Stage 1

At this stage, we shall use three sentences to state an inference. Our proposal is to use the verb 'possess' as the copula instead of the verb 'be' of Western logic. Each of the three sentences expressing an inference has to be analysed into three parts, subject, predicate and copula; as in traditional Western logic, the copula will not be a part either of the subject or of the predicate, but will be a separate part. The copula will have the following characteristics:

(a) The copula in N-N inference must be a form of the verb 'possess' ('have').
(b) It must be in the present tense.
(c) It must be affirmative, the negative particle must be included in the predicate like the sign of tense.

Now we transform the sentence of Inf. N-N 1. The conclusion will be stated thus:

(iii) The hill possesses fire

Where the predicate word is now 'fire' and not 'fire-possessing', the suffix '-possessing' being transferred to the copula. This is what Rule N-N 1 accomplishes.

The expression stating the reason 'because of smoke' will now be stated in the form of a sentence thus:

(ii) The hill possesses smoke

Where *h* is what the predicate word 'smoke' denotes, i.e., smoke. Now we have to add one more sentence corresponding to the major premise of the traditional corresponding to the major premise of the traditional syllogism. This will state the relation of pervasion between *h* and *s* which is understood. It will be:

(i) Whatever possesses smoke possesses fire

So Inf. N-N 1 in this new form will be:

Inf. N-N 1 Eng. (1). (i) Whatever possesses smoke possesses fire.
(ii) The hill possesses smoke
(iii) ∴ The hill possesses fire.

Now we come to Inf. N-N 2 and see how our proposal makes Rule N-N 1 evident. The conclusion of this inference is stated in the sentence.

(a) This is fire

Where the verb is 'is'. We now have to transform this sentence in such a way that the copula becomes a form of the verb 'possess'.

Therefore we have the sentence

(iii) This possesses fire-ness (i.e., the property of being a fire) and this is exactly what Rule N-N 1 achieves. The *s* here is fire-ness denoted by the predicate word 'fire-ness', the suffix '-ness' has been added to 'fire' in (a). So Inf. N-N 2 will have the following form:

Inf. N-N 2 Eng. (1) (i) Whatever possesses heat possesses fire-ness.
(ii) This possesses heat
(iii) ∴ This possesses fire-ness.

We now put the traditional Western syllogism Inf. 1 in this Navya-Nyāya form to show how the two forms differ.

Inf. 1 N-N Eng. (1) (i) Whatever possesses humanity possesses mortality.
(ii) Socrates possesses humanity.
(iii) ∴ Socrates possesses mortality.

The first point of difference to be noted here is that while according to the traditional logic, the three terms of Inf. 1 are (i) man, (ii) mortal and (iii) Socrates, according to Navya-Nyāya they are (i) humanity, (ii) mortality and (iii) Socrates. Rule N-N 1 can be used for a wider purpose to determine the predicate of *any sentence*, not merely the *s* which is the predicate of the *conclusion*. This can be illustrated by considering the sentence

S1. Socrates is wise.

We can apply Rule N-N 1 in two ways to S1. (i) We may add the suffix '-ness' to 'wise' as it does not contain the suffix '-possessing', and get 'wiseness', and the predicate is what is meant by this word, i.e., the property of being wise, or wisdom. (ii) But we can also transform S1 into

S1* Socrates is wisdom-possessing

and then apply Rule N-N 1 to get 'wisdom' by dropping 'possessing'. The predicate here is what is meant by 'wisdom', i.e., wisdom, as before. Thus, according to Rule N-N 1, the predicate is wisdom.

The Rule N-N 1 is a fairly rigorous rule for determining the predicate of any sentence. This contrasts sharply with the present-day situation in the West. There is no agreed way of analysing even such a simple sentence as S1 into its subject and predicate. We list here 5 different ways of analysing S1 into its subject and predicate.

	Subject	*Predicate*
(1)	Socrates	wise
(2)	Socrates	wisdom
(3)	'Socrates'	'is wise'
(4)	'Socrates'	'– is wise' or 'O is wise'
(5)	Socrates	that he is wise.

It is impossible to *define* the terms 'subject' and 'predicate', i.e., to give their *sense*, when they do not have any agreed *reference*. Terms which do not have the *same reference* cannot have *the same sense*; so

one has to conclude that there are really 5 pairs of *different terms* here, and not only one pair. Rule N-N 1 does not show us how to define the sense, but only how to determine uniquely the referent of 'predicate' in any given sentence.

The second point of difference is that Navya-Nyāya analyses the process of inference as a process of knowing, and is invariably talking about *objects* of knowledge, and not about words or sentences. Knowledge has to be expressed in language if there is to be any discussion about it, but the process of inference has to be sharply distinguished from the sentences used to express it. To talk about, to discuss, to study inferences, sentences have to be *used*; the analysis of inferences is to be carried out *by means of* language, but this analysis is itself not a linguistic analysis, not an analysis of language. Hence the terms of inference, according to Navya-Nyāya, are always objects, i.e., things or their properties and relations, unless we are inferring about words, i.e., *mentioning* them.

The third point of difference is also fundamental. It concerns the interpretation of the first premise which is universal. The N-N interpretation of this is completely different from the interpretation of a singular sentence. The universal premise has to be transformed into a sentence where *h* and *s* become explicit. This premise states an invariable concomitance between *h* and *s*. The fundamental difference between N-N interpretation and the traditional Western interpretation may be clear is we compare the two forms of any inference. The traditional Western interpretation of Inf. 2, for example, is given in Inf. 2A, where 'all cats like milk' and 'Pussy likes milk' are treated in the same way, namely, the subjects remain the same, only the predicates are transformed to make the copula explicit. But the N-N form of Inf. 2 is:

Inf N-N 2 Eng. (1) (i) Whatever possesses the property of being a cat possesses the property of liking milk
(ii) Pussy possesses the property of being a cat.
(iii) ∴ Pussy possesses the property of liking milk.

Here the three terms are: *s* – the property of liking milk; *h* – the property of being a cat; *p* – pussy.

If (i) were treated in the same manner as (ii) or (iii), then it would have become

(1*) All cats possess the property of liking milk,

which would not have shown the *h* which is not cat, but the property of being a cat. The N-N interpretation of (i) is thus essentially similar to the interpretation of the modern symbolic logicians. We shall see below why Navya-Nyāya needs to interpret this premise in this way.

4 ARISTOTLE AND NAVYA-NYĀYA

We now leave traditional logic and compare and contrast Aristotle's theory of syllogism with the Navya-Nyāya theory of inference. 'A true example of the Aristotelian syllogism' is given by Łukasiewicz thus:

Aris. Syl. 1. 'If all men are mortal
And all Greeks are men
Then all Greeks are mortal.'
(Łucasiewicz 1958, p. 2)

If we accept Łukasiewicz's interpretation of the Aristotelian syllogism as an implication, then its difference from Navya-Nyāya inference will be fundamental. For, according to Navya-Nyāya, in every inference we pass from the knowledge of something to the knowledge of something else justified by the former, and hence the premises and the conclusion are all asserted.

We now study Aristotle's theory in some detail. Łukasiewicz says: 'Aristotle always puts the predicate in the first place and the subject in the second. He never says, "All B is A", but uses instead the expression "A is predicated of all B" or more often "A belongs to all B"' (p. 3). Bochenski gives the following example of Celarent:

Aris. Syl. 2. 'If stone belongs to no man
And man belongs to all Greeks
Then stone belongs to no Greek.'
(Bochenski 1961, p. 66)

It is clear that 'belong' cannot be used *in its ordinary sense*, for its ambiguity will vitiate the inference. This ambiguity can be brought out if we replace 'man' by 'sons of Mr Smith', and 'Greek' by 'clubs in the village' to get the following example:

Aris. Syl. 2A. If stone belongs to no sons of Mr Smith
and sons of Mr Smith belong to all clubs in the village
then stone belongs to no clubs in the village.

But this inference is invalid, because the stone *may* very well belong to some clubs in the village. The fallacy here is due to using 'belong' in

the first premise and the conclusion in the sense *of legal ownership*; but in the second premise in the sense of *membership of a club*. It is also otherwise clear that 'belong' is used by Aristotle in a technical sense. 'Man belongs to all Greeks' will be regarded as a very awkward expression for 'All Greeks are men', and 'stone belongs to no man' can only mean 'no man is a stone', and not 'no man is the legal owner of the stone'. Łukasiewicz's 'true example of Aristotelian syllogism' (aris. Syl. 1) will be reduced to the following awkward form if 'belong' is used instead of 'are':

Aris. Syl. 1B. If mortal belongs to all men
and man belongs to all Greeks
then mortal belongs to all Greeks.

If 'belong' is used in its ordinary sense, then this syllogism will have to be rewritten in the following way:

Aris. Syl. 1B* If *mortality* belongs to all *men*
and *humanity* belongs to all *Greeks*
then *mortality* belongs to all *Greeks*.

But now there are 4 terms in the syllogism instead of the necessary 3 – (i) mortality, (ii) man, (iii) humanity, and (iv) Greeks.

It is interesting to note that Mrs Kneale gives this type of schema for Barbara, involving four terms, without realising this fact. She writes, '.... he [Aristotle] suggests that in demonstration the major, or most general, term is shown to be predicable of the middle, which is itself predicable of the minor. Obviously he has in mind a chain of forms, say, X-ness, Y-ness and Z-ness so arranged that we can say "Because X-ness belongs to every Y, and Y-ness belongs to every Z, X-ness must belong to every Z." This pattern is in fact peculiar to tone of the syllogistic forms he recognizes, but it supplies the terminology for the whole system' (Kneale & Kneale 1962, p. 68). Now in saying 'Because X-ness belongs to every Y, and Y-ness belongs to every Z, X-ness must belong to every Z', Mrs Kneale uses 4 terms – X-ness, Y, Y-ness and Z. It is not clear what happens to Z-ness which she mentions. We shall see below why 4 terms are necessary to state an Aristotelian syllogism using 'belong' instead of the usual copula.

It is clear that in Aristotle's syllogism 'belong' is used in a technical sense, i.e., only in the sense of 'is predicated of'. Although modern symbolic logicians find a fundamental difference in the structures of subject–predicate and relational propositions, yet traditional logicians themselves interpreted subject–predicate propositions as a special type

of relational propositions. Łukasiewicz states, 'This observation of the Stoics, which Alexander tries to confute without producing convincing counter-arguments, corroborates the supposition that the logic of Aristotle was conceived as a theory of special relations, like a mathematical theory' (Łucasiewicz 1958, p. 15). These 'special relations' which Aristotle uses in his theory of syllogism are those which are stated in subject–predicate propositions. These relations are enumerated by Aristotle in his doctrine of predicables. Thus Kneale writes, 'The headings indicate the relation which the predicate may have to the subject in such propositions. In the first place it may be the *definition* of the subject.... Secondly, the predicate may be a *property* of the subject.... Thirdly, the predicate may be the *genus* of the subject.... Fourthly, the predicate may be an *accident*, i.e., a character which can belong to instances of the species, but need not so belong' (Kneale & Kneale 1962, p. 35). H. W. B. Joseph writes: 'In the present chapter [on Predicables] we have to consider another division of terms, based upon the relation in which a predicate may stand to the subject of which it is predicated. Aristotle recognizes four such relations, and one of them he subdivides, obtaining five in all.... According to Aristotle, in every judgment the predicate must be either the *definition*, the *genus*, the *differentia*, a *property* or an *accident* of the subject' (Joseph 1961, p. 66). Writing about Aristotle's syllogism, Joseph says, 'A syllogism is actually an argument in which, from the given relation of two terms, *in the way of subject and predicate*, to the same third term, there follows necessarily a relation, *in the way of subject and predicate*, between these two terms themselves' (ibid., p. 249; author's italics). Thus 'A is predicated of B' means in Aristotle that A is related to B in any one of the five relations specified by him in the doctrine of predicables.

According to Aristotle, the predicate *inheres* in the subject, i.e., the Aristotelian syllogism, especially demonstration, is a theory of the relation of inherence. Bochenski gives the following translation from Aristotle: 'There are three elements in demonstration: (1) what is proved, the conclusion – an attribute inhering essentially in a genus; (2) the axioms, i.e., the starting points of proof; (3) the subject-genus whose attributes i.e., essential properties, are revealed by the demonstration.' On this, Bochenski makes the following comments: 'It emerges clearly from this text that for Aristotle a demonstration (1) is a syllogism, (2) with specially constructed premises, and (3) with a conclusion in which a property is predicated of a genus. That, however, can only be achieved by means of a syllogism in the first figure' (Bochenski 1961, p. 73). Now this will

help us to understand why Kneale has to use 4 terms to explain a demonstration. In the conclusion 'an attribute inhering essentially in the genus' is to be stated. But, then, in every Aristotelian syllogism, at least one term has to be used as both subject and predicate. Now in the first figure this is the middle term which is so used. But when a term is used as a subject, it is not an attribute; when it is used as a predicate it is an attribute. Thus Kneale has to say, 'Because X-ness belongs to every Y, and Y-ness belongs to every Z' where she has to use once the term 'Y' when it is the subject, and again the term 'Y-ness' when it is the predicate. Thus in every demonstration there will be 4 terms.

Now we come to another point. It concerns the ambiguity of the copula in Aristotelian and traditional syllogisms. We have seen that according to Aristotle the sign of predication expresses any one of the five relations, thus making the copula ambiguous. As a matter of fact, modern logicians have criticized the traditional logicians for confusing different senses of the verb 'be' used as the copula – (i) class inclusion, (ii) class membership, (iii) identity. But if we accept Joseph's characterization of a syllogism as 'an argument in which, from the given relation of two terms, in the way of subject and predicate, to the same third term, there follows necessarily a relation, in the way of subject and predicate, between these terms', then it is *not necessary* to distinguish between the different senses of the copula, *for developing a theory of syllogism*. The ambiguity of predication does not affect the validity of the syllogism. This will be clear if we examine the following three types of traditional syllogism.

Type A	All M is P All S is M ∴ All S is P	Type B	All M is P s is an M ∴ s is a P where 's' is a name
Type C	Tully is wise Cicero is Tully ∴ Cicero is wise.		

It is clear that syllogisms of all these three types will be valid, although for different reasons.

Type A will be valid because of the transitivity of class-inclusion.

Type B will be valid because of the following set-theoretic law:

$$A \subseteq B,\ a \in A \ \therefore\ a \in B.$$

Type C will be valid because of the substitutivity of identicals.

Thus the ambiguity of predication will not affect the validity of syllogism.

But this is not the case with 'possess' which we have proposed to use as the copula in N-N inferences. It is as ambiguous in its ordinary usage as 'belong', and *its ambiguity,* like the ambiguity of 'belong', *vitiates the inference.* First of all, we note that 'possess', in its ordinary sense, is not transitive.

From

a possesses *b*
b possesses *c*

we cannot infer

a possesses *c*,

just as in the case of 'belong' we cannot infer

a belongs to *c*
from *a* belongs to *b* and *b* belongs to *c*.

As a matter of fact, 'belong' in its ordinary sense is the converse of 'possess'. So 'possess', too, has to be given a technical sense.

The meaning which Navya-Nyāya logicians ascribe to 'possess' includes Aristotle's inherence, although it is wider than inherence. Indian logicians belonging to different schools were interested in a certain type of relations which produce the knowledge of one of its terms being *in* (*upon, at*) the other. In their logic they considered exclusively this type of relations which they termed 'occurrence-exacting' (*vṛttiniyāmaka*). For example, the relation of a quality to anything which has it is an occurrence-exacting relation, for we know that the quality is in the thing (the quality *inheres* in the thing), and this quality may be a generic quality, a differentia, a proprium or an accident in the sense of Aristotle. But the Indian concept of occurrence-exacting relation if the book *is on* the table. Thus a relation between two *things* can be an occurrence-exacting relation. But according to Aristotle, as we have already seen, only an *attribute* can *belong* to a thing. Now Navya-Nyāya logicians define the term 'property' (*dharma*) as the second member (*pratiyogin*) of occurrence-exacting relations which alone are to be denoted by the technical term 'possess' as used in inferences. Thus the table *possesses* the book when the book is on the table, and the book is a *property* of the table. To distinguish this sense of 'property' from the usual Western sense, we shall write 'property (N-N)'. Thus even though in ordinary Sanskrit

one says that a person possesses dogs, houses, landed property, etc., yet dogs etc. cannot be said to be the property (N-N) of the person, because a person possessing a dog does not produce the knowledge that the dog is in (on, or upon) him, he is simply the owner of the dog. On the other hand, if a person is carrying a dog, whether he be its owner or not, the dog, then, will be his property (N-N).

The suffix '-possessing' is used in Navya-Nyāya as a *concretization operator,* and the suffix '-ness' as an abstraction operator, on terms. In ordinary Sanskrit, as in other natural languages, if a *concrete term is given,* an *abstract* term can be formed from it, and *given an abstract term,* a *concrete* term can be formed. Thus from the adjective 'ugly' (a concrete term) we can form the abstract term 'ugliness' by the suffix '-ness'; and from the abstract term 'beauty' we can form a concrete term 'beautiful'. Navya-Nyāya logicians, however, generalize this procedure of natural languages and form concrete and abstract terms from *any terms whatsoever.* This is connected with their very wide concept of property, i.e., property (N-N). From the concrete term 'pot', they form not merely the abstract term 'pot-ness', but also another concrete term 'pot-possessing' to denote anything which has the pot as a property (N-N), i.e., anything which has the pot on, or upon, or in it; for example, the floor (*on* which the pot is), or the box (*in* which it is). We can go on like this. For example, *if* a book *is on* the table, using 'possess' in its strict sense, we shall have

the table possesses the book

Whence the book becomes a property (N-N) of the table. Thus the table becomes the book-possessing thing and the term 'this book-possessing', here, will denote the table. Now if the table is, in its turn, *on* the floor, the floor will be table-possessing, so that 'this table-possessing' will denote the floor. As the table is denoted by 'this book-possessing', the floor will be denoted by '(this book-possessing)-possessing' and so on.

The abstraction operator '-ness' and the concretization operator '-possessing' denote inverse operations, so that a-possessing-ness = a-ness-possessing = a. But as there are concrete terms of higher orders in which the concretization operator occurs a number of times, so also there are corresponding abstract terms of higher orders in which the abstraction operator '-ness' is iterated. Thus from the doubly concrete term '(book-possessing)-possessing' we can form the doubly abstract term '(((book-possessing)-possessing)-ness)-ness' to denote again the book; for the floor is denoted by '(book-possessing)-possessing', so that the term '((book-possessing)-possessing)-ness' denotes the table which

is the property (N-N) of the floor, and '(((book-possessing)-possessing)-ness)-ness' denotes the property (N-N) of the table which is the book.

But there are abstract terms of higher orders formed from *abstract terms* also – like 'cow-ness-ness', which denotes the property (N-N) of the property (N-N) of a cow, which term may be symbolized as '$(\lambda y)(y = (\lambda x)(Cx))$', where 'Cx' is 'x is a cow', and 'λ' is the abstraction operator. What these higher order abstract terms formed from abstract terms in the ordinary sense mean, has been debated even within the school of Navya-Nyāya But the need for such higher order abstract terms is felt to explain the mode (*prakāra*) under which cowness is to be cognized when it is *denoted* by the abstract term 'cow-ness'. The Navya-Nyāya theory of meaning of words requires that *every word* denotes whatever it denotes only under a mode. The word 'cow' denotes anything which is a cow only under the mode of being a cow, i.e., cow-ness. But the word 'cow-ness' which denotes the property of being a cow must have its *own mode of presentation*, which is *denoted* by 'cow-ness' and so on. This corresponds to Frege's problem of infinite regress of sense and denotation of higher and higher orders.

Thus although, in principle, there is the possibility of forming higher and higher orders of concrete and abstract terms, yet Navya-Nyāya logicians, being interested in inference only as a *form of knowing*, reject very artificial concrete and abstract terms of arbitrary orders as not permissible, because they are never actually known.

Now we can understand why Navya-Nyāya logicians have to interpret the universal premise in a way different from Aristotle and the traditional logicians of the West This is due to the fact that the concept of occurrence-exacting relation, denoted by 'possess' in its technical sense, is much wider than the concept of inherence denoted by the copula. Thus the form

a possesses *b*
b possesses *c*
∴ *a* possesses *c*

will not be a valid form of inference even when 'possess' is used in its technical sense. For example,

The table possesses the book
The floor possesses the table

Will not imply

The floor possesses the book

To solve this difficulty, Indian logicians generally, and Navya-Nyāya logicians in particular, interpret the universal premise in a way which is totally different from the Aristotelian or the traditional way. Any occurrence-exacting relation can be used in the premises and the conclusion of a Navya-Nyāya inference. Thus the second premise and the conclusion need not have the same relation:

(ii) $p \; R_1 \; h$
(iii) ∴ $p \; R_2 \; s$,

Where both R_1 and R_2 are occurrence-exacting relations. To complete the inference the first premise is stated by Navya-Nyāya logicians in the form:

(i) $(x)\,(x \; R_1 \; h \supset x \; R_2 \; s)$

Raghunātha Śiromaṇi (16th century), one of the greatest logicians of India, pointed out that if the first premise is stated in the form (i), then there is no need to restrict 'possess' to occurrence-exacting relations – any relation whatever can be used. For the form

(i) $(x)\,(x \; R_1 \; h \supset x \; R_2 \; s)$
(ii) $p \; R_1 \; h$
(iii) ∴ $p \; R_2 \; s$

will be valid for any relations, R_1 and R_2, and not merely for occurrence-exacting relations.

Thus we see why it is necessary for Navya-Nyāya logicians to interpret the universal premise not as a subject-predicate proposition. This premise is always stated in the form 'whatever possesses *h* possesses *s*', where the two occurrences of 'possess' need not stand for the same relation. Indian logicians in general, and Navya-Nyāya logicians especially, have devoted much attention to the study of the nature of this relation of *h* to *s* stated in (i) – *h* is said to be pervaded by *s* if and only if (i) holds.

Stage 2

So far we have stated a Navya-Nyāya inference by three sentences. Now we show that there is another step in the process of inference which has to be expressed in another sentence. By writing 'smoke is pervaded by fire' in place of 'whatever possesses smoke possesses fire' in Inf. N-N I. Eng. (1) we get the following three steps:

Inf. N-N I. Eng. (1)* (i) Smoke is pervaded by fire.
(ii) The hill possesses smoke.
(iii) ∴ The hill possesses fire.

The Navya-Nyāya logicians argue that in the process of inferring (iii) from (i) and (ii), one more step comes in between (ii) and (iii). At this step the two premises (i) and (ii) are *taken together*, for the conclusion follows from the premises taken together. This step will synthesize (i) and (ii) into a complex judgement thus:

The hill possesses smoke (which is) pervaded by fire.

This complex judgement or knowledge is called *consideration* (*parāmarśa*). Thus the whole process of inference involves the following 4 steps:

Inf. N-N I. Eng. (2) (i) Smoke is pervaded by fire
(ii) The hill possesses smoke.
(iii) The hill possesses smoke pervaded by fire.
(iv) ∴ The hill possesses fire.

The Mīmāṁsā logicians do not admit (iii) of inferential synthesis of (i) and (ii). They argue that to say that in an inference the conclusion follows from the two premises *taken together* is simply to say that *both* of them are necessary (and sufficient) to imply the conclusion, that the conclusion does not follow from *any one* of (i) and (ii). It is *unnecessary* to postulate a complex judgement like consideration as an additional necessary step for the inference. Moreover, if the premises have to be 'taken together', they have to be given separately. Thus steps (i) and (ii) will be *necessary* even for consideration, i.e., step (iii). It will, therefore, be much simpler to hold that the conclusion follows from (i) *and* (ii), i.e., from a conjunction of them, than to postulate (iii) as intervening between (ii) and (iii).

The Navya-Nyāya logicians point out that the Mīmāṁsā logicians have missed the essential function of the h (i.e., the middle term) in an inference. For mere conjunction of two premises it is not necessary that they have a common term; any two premises can be conjoined. The fact that the middle term must be *common* to both the premises shows that mere conjunction is not here intended, that they have to be combined in a way different from mere conjunction. According to the Navya-Nyāya logicians, the *entire function* of the middle term is exhausted in relating *p* (the minor term) with *s* (the major term). To perform this function what is necessary and sufficient for the middle term is that it be related to the major term in a special way and to the

minor term in a special way. It is not at all necessary to know any *other* special property (N-N) that the middle term may have. Thus even if we do not know whether the thing on the hill is smoke or light, we shall be able to infer the presence of fire there, for smoke and light both are pervaded by fire. It is sufficient for us to know that there is *something* which has the requisite relations with the major and the minor terms. Thus even if we do not know (ii), we can infer the conclusion from:

(iii)* The hill possesses *something* pervaded by fire.

This shows that the specific property (N-N) of the middle term – that it is *smoke* – is not relevant for the inference.

If it is granted that the specific nature of the middle term is not relevant for the inference, then it becomes necessary to combine the two premises in a complex judgement. For we cannot argue:

Inf. N-N 1. Eng. (2)* (i) Something is pervaded by fire.
(ii) The hill possesses something.
(iii) ∴ The hill possesses fire.

for the something in (i) and the something in (ii) are not necessarily the same. Navya-Nyāya logicians point out that we may very well argue, in case the above argument is valid, in the following way:

Inf. N-N 1. Eng. (2)** (i) Smoke is pervaded by fire.
(ii) The hill possesses light.
(iii) ∴ The hill possesses fire.

for light too, like smoke, is a *probans* (*h*) of fire. To ensure that the *something* in (i) and the *something* in (ii) are the same, the two judgements have to be combined to form *one* judgement, although more complex in structure than (i) or (ii), thus:

The hill possesses something which is pervaded by fire. The point of the Navya-Nyāya logicians is, therefore, this. We cannot have any inference from

(i) (∃x) (x is pervaded by fire)
(ii) (∃x) (the hill possesses x)

but we can have an inference from

(iii) (∃x) (the hill possesses x. x is pervaded by fire).

(iii) here is *weaker than* the conjunction of (i) and (ii) of Inf. N-N 1. Eng. (1), in the sense that from the conjunction, 'the hill possesses

smoke and smoke is pervaded by fire' we can infer (iii), but (iii) does not imply this conjunction. The Navya-Nyāya logicians argue that the necessary and sufficient condition for inference is (iii) by itself, and not the conjunction of (i) and (ii), nor even (i) and (ii) *separately* of Inf. N-N 1. Eng. (1)* To know (iii) it is not necessary to know either (i) or (ii) or both. Thus, if someone tells us that there is something on the hill which is pervaded by fire, we can at once infer that there is fire on the hill, without the additional information whether that something is smoke or light or any other thing.

By their insistence that both the premises have to be known, the Mīmāṁsā logicians really mean that the middle term (*h*) has to be known in its specific character, which the Navya-Nyāya logicians deny. We may explain this point of the Navya-Nyāya logicians by an analogous case in the concept of the relative product of relations. To prove that the relative product of the two relations, R and S, holds between the terms, *a* and *b*, i.e., to show that *a* R/S *b*, we may show that there is a particular thing *c* such that *a* R *c* and *c* S *b*. But this is not necessary, for by definition of relative product of relations, it is sufficient to show that there is *something* such that *a* is related to it by R, and it is related to *b* by S, i.e., $(\exists x)(aRx . xSb)$.

Now we see how Navya-Nyāya refutes the claim of Mīmāṁsā that even in order to have the consideration, the two premises have to be known first. It is evident that the two premises need not be known if the consideration is known. The consideration is weaker than the conjunction of the two premises.

This also explains why there is no infinite regress in the Navya-Nyāya position, namely, another synthesis of the two premises and their synthesis and so on. For according to Navya-Nyāya, the synthesis *by itself* suffices for the inference, and to know the synthesis it is not necessary to know the two premises.

This argument of Navya-Nyāya logicians can be carried over to Western syllogisms considered as an inference or an implication. To explain this point, we consider how we can get an instance of a syllogism from its *form*. The form Barbara is often stated as the law of the transitivity of class inclusion:

$$\text{(B)} \quad (b)(c)(a)(a \subseteq b . c \subseteq a . \supset c \subseteq b),$$

where 'a', 'b' and 'c' are class variables. Now to get a concrete example of a syllogism of the form (B), it is usually thought necessary to instantiate *all the variables* by constants. This may be done in the following way:

Syl. 1 (1) $(c)(a)(a \subseteq M . c \subseteq a . \supset c \subseteq M)$ (B) UI
(2) $(a)(a \subseteq M . K \subseteq a . \supset K \subseteq M)$ 1, UI
(3) $H \subseteq M . K \subseteq H . \supset K \subseteq M$ 2, UI

where 'H', 'K' and 'M' are abbreviations of 'the class of men', 'the class of kings' and 'the class of mortals'.

Now Syl. 1 (3) can be regarded as a concrete example of Barbara, if we regard syllogism as an implication. If, however, we want to infer 'all kings are mortal' ('$K \subseteq H$'), then we have to affirm the antecedent of Syl. 1 (3) which is a conjunction, by affirming the two conjuncts,

(4) $H \subseteq M . K \subseteq H$
(5) $\therefore K \subseteq M$.

But it is not necessary to instantiate the middle term in order to have a syllogism.

Syl 2. (1) $(c)(a)(a \subseteq M . c \subseteq a . \supset c \subseteq M)$ } same as
(2) $(a)(a \subseteq M . K \subseteq a . \supset K \subseteq M)$ } in Syl. 1.
(3) $(\exists a)(a \subseteq M . K \subseteq a) \supset (K \subseteq M)$ by rules of quantification.

If we want to infer '$K \subseteq M$', then we have to assert

(4) $(\exists a)(a \subseteq M . K \subseteq a)$

which becomes a premise of the syllogism, and not Syl. 1 (4).

For we can now have

(5) $K \subseteq M$ 3, 4, MP

just as in Syl. 1.

Now the question is whether Syl. 2 should be regarded as a syllogism at all. We give the following reason for regarding it as a syllogism. If we accept the theory that the middle term of a syllogism need not be specified, then we can explain why given the conclusion 'all kings are mortal', we cannot uniquely determine the premises from which it follows, although in this particular case the figure and the mood are uniquely determined. This indeterminacy of the premises (not of the form of the premises) is due wholly to the fact that different middle terms can be used to construct premises from which 'all kings are mortal' can be deduced syllogistically. The theory that the conclusion of a syllogism follows only from a conjunction of its so-called premises fails to bring out this essential feature of the middle term.

Formal Logic (1956). This will, perhaps, be enough to justify my use of the term "logic" when I am trying to cover similar ground.

Logic as the study of the form of correct arguments and inference-patterns, developed in India from the methodology of philosophical debate. The art of conducting a philosophical debate was prevalent probably as early as the time of the Buddha and the Mahāvīra (Jina), but it became more systematic and methodical a few hundred years later. By the second century BC, the intellectual climate in India was bristling with controversy and criticism. At the center of controversy were certain dominant religious and ethical issues. Nothing was too sacred for criticism. Such questions as: "Is there a soul different from body?", "Is the world (*loka*) eternal?", "What is the meaning, goal, or purpose of life?", and, "Is renunciation preferable to enjoyment?", were of major concern. While teachers and thinkers argued about such matters, there arose a gradual awareness of the characteristics or patterns of correct – that is, acceptable and sound – reasoning, and concern about how it differs from the kind of reasoning that is unacceptable.

2 A HISTORICAL SKETCH OF LOGICAL ISSUES IN INDIA: DEBATE AND LOGIC

Logic developed in ancient India from the tradition of *vādavidyā*, a discipline dealing with the categories of debate over various religious, philosophical, moral, and doctrinal issues. There were several *vāda* manuals available around the beginning of the Christian era. They were meant for students who wanted to learn how to conduct debates successfully, what tricks to learn, how to find loopholes in the opponent's position, and what pitfalls to be wary of. Of these manuals, the one found in the *Nyāyasūtras* of Akṣapāda Gautama (circa 150 AD) is comparatively more systematic than others. We shall hence follow it in this introductory exposition.

Debates, in Akṣapāda's view, can be of three types: (i) an honest debate (called *vāda*) where both sides, proponent and opponent, are seeking the truth, that is, wanting to establish the right view; (ii) a tricky-debate (called *jalpa*) where the goal is to win by fair means or foul; and (iii) a destructive debate (called *vitaṇḍā*) where the goal is to defeat or demolish the opponent, no matter how. This almost corresponds to the cliché in English: the good, the bad and the ugly. The first kind signals the employment of logical arguments, and use of rational means and proper evidence to establish a thesis. It is said that

the participants in this kind of debate were the teacher and the student, or the students themselves, belonging to the same school.

The second was, in fact, a winner-takes-all situation. The name of the game was wit or intelligence. Tricks, false moves, and unfair means were allowed according to the rules of the game. But if both the debaters were equally clever and competent, this could be kept within the bounds of logic and reasoning. Usually two teachers of different schools would be participants. This used to take place before a board or jury called the *madhyastha* (the mediators or adjudicators) and a chairman, usually a king or a man with power and money who would organize the debate. The winner would be declared at the end by the consensus of the adjudicators.

The third type was a variety of the second type, where the winner was not supposed to establish his own position (he may not even have had a position) but only to defeat the opponent using logical arguments, or as the case was, tricks or clever devices. It was explicitly destructive and negative; hence philosophers like Vātsyāyana (circa 350 AD) denounced this form of debate in unambiguous language. Again, a clever and competent opponent might force the other side into admitting a counter-position ("If you deny my thesis p, then you must admit the thesis not-p; therefore, please establish your thesis"), and if the other side yielded, the debate was decided in favor of the former, or it would turn into the second form of debate.

The notoriety of the third type was universal, although some philosophers (for example, Nāgārjuna, Śrīharṣa) maintained that if the refutations of the opponent were done on the basis of good reason and evidence (in other words, if it followed the model of the first type, rather than the second type) then lack of a counter-thesis, or non-establishment of a counter-thesis, would not be a great drawback. In fact, it could be made acceptable and even philosophically respectable. That is why Gauḍa Sānātani (quoted by Udayana; see Matilal, 1986: 87) divided the debates into four types: (i) the honest type (*vāda*), (ii) the tricky type (*jalpa*), (iii) the type modeled after the tricky type but for which only refutation is needed, and (iv) the type modeled after the honest one where only the refutation of a thesis is needed. Even the mystics would prefer this last kind, which would end with a negative result.

Apart from developing a theory of evidence (*pramāṇa*) and argument (*tarka*) needed for the first type of debate, the manuals go on to list a number of cases, or situation-types, where the debate will be concluded and one side will be declared as "defeated" (or

nigraha-sthāna, the defeat situation or the clinchers). The *Nyāyasūtra* lists 22 of them. For example, (a) if the opponent cannot understand the proponent's argument, or (b) if he is confused or (c) if he cannot reply within a reasonable time limit – all these will be cases of defeat. Besides, these manuals identify several standard "false" rejoinders or *jāti* (24 of them are listed in the *Nyāyasūtra*), as well as some underhand tricks (*chala*) like equivocation and confusion of a metaphor for the literal. Now we may survey the type of logical theorizing that arose out of the study of debate in India.

The Nyāya Model

Akṣapāda defined a method of philosophical argumentation, called the *nyāya* method or the *nyāya* model. This was the standard for an ideally-organized philosophical disputation. Seven categories are identified as constituting the "prior" stage of a nyāya. A *nyāya* starts with an initial doubt, as to whether *p* or not-*p* is the case, and ends with a decision, that *p* (or not-*p*, as the case may be). The seven categories, including Doubt, are: Purpose, Example, Basic Tenets, the "Limbs" of the formulated reasoning, Supportive Argument (*tarka*), and Decision. Purpose is self-explanatory. The example is needed to ensure that the arguments would not be just empty talk. Some of the Basic Tenets supply the ground rules for the argumentation.

The "Limbs" were the most important formulation of the structure of a logical reasoning; these are a landmark in the history of Indian logic. According to the *Nyāyasūtras*, there are five "Limbs" or "steps" in a structured reasoning. They should all be articulated linguistically. The first step is the statement of the thesis, the second the statement of reason or evidence, the third citation of an example (a particular case, well-recognized and acceptable to both sides) that illustrates the underlying (general) principle and thereby supports the reason or evidence. The fourth is the showing of the present thesis as a case that belongs to the general case, for reason or evidence is essentially similar to the example cited. The fifth is the assertion of the thesis again as proven or established. Here is the time-honored illustration:

Step 1. There is fire on the hill.
Step 2. For there is smoke.
Step 3. (Wherever there is smoke, there if fire), as in the kitchen.
Step 4. This is such a case (smoke on the hill).
Step 5. Therefore it is so, i.e., there is fire on the hill.

The Buddhists and others argued that this was too elaborate for capturing the essential structure. All we need would be the first two or the first three. The rest would be redundant. But the Nyāya school asserted all along that this *nyāya* method is used by the arguer to convince others, and to satisfy completely the "expectation" (*ākāṃkṣā*) of another, you need all the five "Limbs" or steps. This is in fact a full-fledged articulation of an inference schema.

Returning to the *nyāya* method itself, the supportive argument (*tarka*) is needed when doubts are raised about the implication of the middle part of the above inference schema. Is the example right? Does it support the evidence? Is the general principle right? Is it adequate? The "supportive arguments" would examine in the alternative possibilities, and try to resolve all these questions. After the supportive argument comes the decision, one way or another.

Another seven categories were identified as constituting the "posterior stage" of the *nyāya* method. They consist of three types of debate (already mentioned), the group of tricks, false rejoinders, and clinchers or defeat situations, and another important logical category, that of pseudo-reason or pseudo-evidence.

Pseudo-evidence is similar to evidence or reason, but it lacks adequacy or the logical force to prove the thesis adduced. It is in fact an "impostor." The *Nyāyasūtra* notes five such varieties. Although these five varieties were mentioned throughout the history of the *nyāya* tradition (with occasional disagreement, for example, Bhāsarvajña, who had six), they were constantly redefined to fit the developing logical theories of individual authors. The five types of pseudo-evidence were: the *deviating*, the *contradictory*, the *unestablished* or *unproven*, the *counter-balanced*, and the *untimely*.

Since there can be fire without smoke (as in a red-hot iron ring), if somebody wants to infer presence of smoke in the kitchen on the basis of the presence of fire there, his evidence would be pseudo-evidence called the "deviating." Where the evidence (say a pool of water) is usually the sign for the absence of fire, rather than its presence, it is called the contradictory. An evidence-reason must itself be established or proven to exist, if it has to establish something else. Hence, an "unestablished" evidence-reason is a pseudo-evidence or a pseudo-sign. A purported evidence-reason may be countered by a purported counter-evidence showing the opposite possibility. This will be a case of the "counter-balanced". An "untimely" is one where the thesis itself precludes the possibility of adducing some sign as being the evidence-reason by virtue of its incompatibility with the thesis in

question. The "untimely" is so-called because as soon as the thesis is stated, the evidence will no longer be an evidence. (For further elaboration, see Matilal, 1985, §1.5).

The Sign and the Signified

All this implicitly spells out a theory of what constitutes an adequate sign. What we have been calling "evidence," "reason," and sometimes "evidence-reason" may just be taken to be an adequate or "logical" sign The Sanskrit word for it is *liṅga*, a sign or a mark, and what it is a sign for is called *liṅgin*, the signified, the "marked" entity. This is finally tied to their theory of sound inference, that is, inference of the signified from the observation of the logical sign. This is the pre-theoretical notion of the "sign-signified" connection, as explained here. Note that this notion of "sign-signified" relation is different from the "signifier-signified" relation that is mentioned in some modern linguistics, especially Saussure.

A sign is adequate or "logical" if it is not a pseudo-evidence, that is, a pseudo-sign. And the five types of pseudo-sign have already been identified. We have here a negative formulation of the adequacy of the sign. A little later on in the tradition the positive formulation was found. The fully-articulated formulation is found in the writings of the well-known Buddhist logician, Diṅnāga (circa 400–480 AD), in his theory of the "triple-character" reason. We will discuss his contribution briefly below, and in more detail in chapter 4 In fact, an adequate sign is what should be non-deviating, that is, it should not be present in any location when the signified is absent If it is, it would be "deviating." Thus, the identification of the first pseudo-sign captured this intuition, although it took a long time to get this fully articulated in the tradition. A sign which is adequate in this sense may be called "logical" for it ensures the correctness of the resulting inference Thus, we have to ask: if the sign is there, can the signified be far behind?

The Triple Nature of the Sign

Diṅnāga formulated the following three conditions, which, he claimed, a logical sign must fulfil:

1. It should be present in the case (object) under consideration.
2. It should be present in a *similar* case or a homologue.
3. It should not be present in any *dissimilar* case, any heterologue.

Three interrelated technical terms are used here. The "case under consideration" is called a *pakṣa*, the "subject-locus." The "similar case" is called a *sapakṣa*, the "homologue." The "dissimilar case" is called a *vipakṣa*, the "heterologue." These three concepts are also defined by the theory The context is that of inferring a property *A* (the *signified* in our new vocabulary) from the property *B* (the *sign*) in a location *S*. Here the S is the *pakṣa*, the subject-locus. The *sapakṣa* is one which already possesses *A*, and is known to do so. And the *vipakṣa* is one which does not possess *A*. The "similarity" between the *pakṣa* and the *sapakṣa* is variously explained. One explanation is that they would share tentatively the signified *A* by sharing the sign *B* An example would make it clear. Smoke is a sign of fire on a hill, because it is present on that hill, and it is also present in a kitchen which is a locus of fire, and it is absent from any non-locus of fire.

The third condition is easily explained. The sign must not be present where the signified is not present. For otherwise, as we have already noted, the sign will be *deviating*, and would be a "pseudo-sign." Why the second condition? Did Diṅnāga overshoot his mark? Is not the second condition redundant (for the first and the third seem to be sufficient to guarantee adequacy)? These questions were raised in the tradition by both the Naiyāyikas like Uddyotakara (circa 550–625 AD), and the Buddhists like Dharmakīrti (circa 600–660 AD). Some, such as Dharmakīrti, maintained that it was slightly repetitious but not exactly redundant. The second condition states positively what the third, for the sake of emphasis, states negatively. The second is here rephrased as: the sign should be present in all *sapakṣas*. The contraposed version can then be formulated with a little ingenuity as: the sign should be absent from all vipakṣas For sapakṣa and *vipakṣa*, along with the *pakṣa*, exhaust the universe of discourse.

Other interpreters try to find additional justification for the second condition to argue against the "redundancy" charge. Logically speaking, it seems that the second condition is redundant, but epistemologically speaking, a case of the co-presence of *A* and *B* may be needed to suggest the possibility, at least, that one may be the sign for the other. Perhaps Diṅnāga's concern here was epistemological.

Diṅnāga's Wheel of Reason/Sign

When a sign is identified, there are three possibilities. The sign may be present in all, some, or none of the *sapakṣas*. Likewise, it may be

present in all, some or none of the *vipakṣas*. To identify a sign, we have to assume that it is present in the *pakṣa* however; that is, the first condition is already satisfied. Combining these, Diṅnāga constructed his "wheel of reason" with nine distinct possibilities, which may be tabulated in Figure 1.1.

Of these nine possibilities, Diṅnāga asserted that only two are illustrative of sound inference for only they meet all the three conditions. They are Numbers 2 and 8. Notice that either (– *vipakṣa* and + *sapakṣa*), or (– *vipakṣa* and ± *sapakṣa*) would fulfil the required conditions. Diṅnāga is insistent that at least one *sapakṣa* must have the positive sing. Number 5 is *not* a case of sound inference; this sign is a pseudo-sign. For although it satisfies the two conditions 1 and 3 above, it does not satisfy condition 2. So one can argue that as far as Diṅnāga was concerned all three were necessary conditions. The second row does not satisfy condition 2 and hence none of Numbers 4, 5, and 6 are logical signs; they are pseudo-signs. Numbers 4 and 6 are called "contradictory" pseudo-signs – an improvement upon the old *Nyāyasūtra* definition of contradictory. The middle one, Number 5, is called "uniquely deviating" (*asādhāraṇa*),

Diṅnāga Wheel of Reason

1 + *vipakṣa* + *sapakṣa*	2 – *vipakṣa* + *sapakṣa*	3 ± *vipakṣa* + *sapakṣa*
4 + *vipakṣa* – *sapakṣa*	5 – *vipakṣa* – *sapakṣa*	6 ± *vipakṣa* – *sapakṣa*
7 + *vipakṣa* ± *sapakṣa*	8 – *vipakṣa* ± *sapakṣa*	9 ± *vipakṣa* ± *sapakṣa*

+ = all, ± = some, – = none.

perhaps for the reason that this sign becomes a unique sign of the *pakṣa* itself, and is not found anywhere else. In Diṅnāga's system, this sign cannot be a sign for anything else, it can only point to itself reflexively or to its own locus. Numbers 1, 3, 7, and 9 are also pseudo-signs. They are called the "deviating" signs, for in each case the sign occurs in some *vipakṣa* or other, although each fulfills the second condition. This shows that at least in Diṅnāga's own view, the second condition (when it is combined with the first) gives only a necessary condition for being an adequate sign, not a sufficient one. In other words, Diṅnāga intended all three conditions jointly to formulate a sufficient condition.

Development of the Wheel by Uddyotakara

Diṅnāga's system of nine reason-types or sign-types was criticized by Uddyotakara, the Naiyāyika, who argued that it was incomplete. Diṅnāga did not consider at least two further alternatives: (a) a situation-type where there is no *sapakṣa*, and (b) a situation-type where there is no *vipakṣa*. The sign's absence from all *sapakṣas* (or all *vipakṣas*) should be distinguished from these two situations. Let us use "0" for the situation-type which lacks any *sapakṣa*, or *vipakṣa*, and "–" for the situation-type where the sign is present in no *sapakṣa* or *vipakṣa* (as before). Hence combining the four possibilities + *sapakṣa*, ± *sapakṣa*, – *sapakṣa*, 0 *sapakṣa* (no *sapakṣa*) with the other four (+, ±, –, 0) *vipakṣa*, we get sixteen portions in our wheel of reason, and the new wheel contains more sound inferences, that is, adequate signs. For example,

> This is nameable, because this is knowable.

Here "knowability" is the sign, which is adequate and logical for showing the nameability of an entity, for (in the Nyāya system) whatever is knowable is also nameable (that is, expressible in language). Now we cannot have a heterologue or *vipakṣa* here, for (again according to the Nyāya system) there is nothing that cannot be named (or expressed in language). Within the Buddhist system, another example of the same argument-type would be:

> This is impermanent because it is a product.

For Buddhists everything is impermanent and a product. Later Naiyāyikas called this type of sign *kevalānvayin*, the universal-positive-sign; that is, it is a characteristic of every entity.

Uddyotakara captured another type of adequate reason or logical sign, but he formulated the example of this reasoning (or inference) negatively, that is, in terms of a counterfactual. This was done probably to avoid a doctrinal quandary of the Nyāya school (to which he belonged) in which the explanation of analytic judgements or *a priori* knowledge always presents a problem. His typical example was:

> The living body cannot be without a soul, for if it were it would have been without life.

This is the generalized inference called "universal negative" – *kevalavyatirekin* – in the tradition. The subject S which has a unique property *B* cannot be without *A*, for then it would have been without *B*. Since *B* is a unique property of *S*, and since the presence of *A* and *B* mutually imply each other, there is no *sapakṣa*. But it is a correct inference. Bhāsarvajña (circa 950 AD) did not like the rather roundabout way of formulating the inference-type. He said:

> The living body has a soul, for it has life

But this would verge on unorthodoxy in Nyāya, for (a) the statement of the thesis includes the sign already, and (b) there seems to be a necessary connection between having life and having a soul. The later Nyāya went back to the negative formulation but got rid of the reflex of the counterfactual that Uddyotakara had. If *A* and *B* are two properties mutually implying each other such that *B* can be the definiens (*lakṣaṇa*) and the class of those possessing *A* can be the definiendum, then the following inference is correct:

> The subject S differs from those that are without *A*, for it has *B* (and *A* is defined in terms of *B*)

This seems to be equivalent to:

> *S* has *A*, for it has *B*.

The verbal statement "*S* has *A* because it has *B*," however, does not expose fully the structure of this type of inference. For one thing, in this version it becomes indistinguishable from any other type of correct inference discussed before. In fact, the special feature of this type of inference is that the inferable property *A* is uniquely present in *S* alone, and nowhere else, and hence our knowledge of the concomitance or pervasion between *A* and *B* cannot be derived from an example (where their co-presence will be instantiated) which will

be a different case from the S, the case under consideration. In fact, *S* here is a generic term and it will be proper to say: all *S* have *A*, for they have *B*, and a supporting example will have to be an *S*, that is, an instance of *S*. To avoid this anomaly, a negative example is cited to cover these cases. Thus we can say, a non-*S* is a case where neither *A* nor *B* are present. This will allow one to infer, for example, absence of *B* from absence of *A* and also (since *A* and *B* are co-present in all cases) absence of *A* from absence of *B*. But the evidence here is *B*. Hence by seeing absence of *B* in all S we can infer absence of *A*. Such a roundabout formulation was dictated by the peculiar nature of the Diṇnāga-Uddyotakara theory of inference.

Let us try to explain. In this theory, what legitimizes the inference of *A* from the sign *B* is the knowledge that *B* is a logical sign of *A*. To have that knowledge, we must have another item of knowledge, that *B* has concomitance, an invariable connection, with *A*. The second item of knowledge must be derived empirically, from an example where it is certain that *A* as well as *B* is present. Without such an example, we would not recognize *B* to be a logical sign of *A*. This limitation precluded the possibility of inferring *A* from *B*, where the case is such that all that have *A* are included in *pakṣa*, the subject-locus of the inference. The convention is that the said example cannot be chosen from the members of the *pakṣa*, that is, of the set of *S*. Hence the difficulty.

Uddyotakara saw this problem and extended the scope of the theory by saying that in these cases, a negative example, a non-*S* having neither *A* nor *B*, and absence of any counter-example (the sign's absence from all *vipakṣas*), will be enough to legitimize the inference. Udayana (circa 975–1050 AD) later on defended this type of inference as legitimate. For, he said, if we do not admit such inferences as valid, our search for a *defining* property of some concepts could not be justified. Suppose we wish to define cow-hood: what is the unique property of a cow? Now, suppose having a dewlap is a unique property of cow; it exists in all and only cows. What is the purpose of such a "definition," if we can call it a definition (*lakṣaṇa*)? It is that we can differentiate all cows from non-cows. How? We do it by means of the following inference: cows are distinct from non-cows, for cows have dewlaps. Of course, the statement "cows are distinct from non-cows" is equivalent to the statement "cows are cows," but when it is put negatively, the purpose of such inference becomes clearer.

Concomitance or Invariable Relation

In the *Pramāṇasamuccaya*, Diṇnāga defined the invariable relation or concomitance of *B* with *A*, which legitimizes the inference of the signified *A* from the sign *B*, as follows:

> When the sign (*liṅga*) occurs, there the signified, that of which it is a sign, has to occur as well. And if the sign has to occur somewhere, it has to occur only where the signified *occurs (liṅge liṅgī bhavaty eva liṅginy evetarat punaḥ)*.

This verse has been quoted frequently by Naiyāyikas, Jainas, and other logicians. It actually amounts to saying that all cases of *B* are cases of A, and only cases of *A* could be cases of *B*.

Dharmakīrti described the invariable connection in two ways. First, the sign *B* could be the "own-nature" or essential mark of *A*. That amounts to saying that *B* is either an invariable or a necessary sign of A. thus, we infer that something is a tree from the fact that it is a beech tree, for a beech tree cannot be a beech tree without being a tree. This only defines invariability or necessary connection. The second type of sign is one when we infer the "natural" causal factor from the effect, as we infer fire from smoke. It is also the nature or the essence of smoke that it cannot originate without originating from fire. Hence invariable relation means: (i) an essential or necessary property of the class, and (ii) a casually necessary relation between an effect and its invariable cause.

The late Naiyāyikas said that the absence of a counter-example is what is ultimately needed to legitimize the inference-giving relation between *A* and *B*. If *B* is the sign, then *B* would be the logical sign if, and only if, there is no case where *B* occurs but *A* does not occur. If *B* occurs where *A* does not, that would be a counter-example to the tacitly assumed rule of inference, "if *B* then *A*." As we know from the truth-table of the propositional logic, "if *B* then *A*" is falsified only under one condition, when not-*A* is true along with *B*. Thus Gaṅgeśa (f. 1325 A.D.) defines this relation:

> *B's* non-occurrence in any location characterized by absence of *A*.

Alternatively, another definition is given:

> *B's* co-occurrence with such an *A* as is never absent from the location of *B*.

The first is rephrasing of the first definition of *vyāpti* (invariable concomitance) in the *Vyāptipañcaka* of Gaṅgeśa. The second is an abbreviation of what is called his *siddhāntalakṣaṇa*, "accepted definition."

On the "Steps" in the Process of Inference: Members of the Syllogism

An essential part of the theory of inference is obviously the knowledge of concomitance or invariance between the inferable property, *A*, and the reason, *B*, the *hetu*. Our knowledge of such invariances is derived, rightly or wrongly, from our observation of such examples illustrating the togetherness of *B* and *A*; we call them *sapakṣas*. The *Nyāyasūtra* author insisted upon the citation of the example to justify or support the reason, to show that there is a relation of concomitance or invariance backing the reason.

A question arises regarding how many steps we need in what is called "*parārthānumana*" or "demonstration to others" of the entire process of inference one makes within oneself. A demonstration is something like the verbal articulation of the process of inference. The Naiyāyikas assert that there should be five steps in this verbal articulation of the inference, where the fifth step would re-state the thesis proven by the reason backed by the required invariance relation. The Buddhist, on the other hand, would need only three steps – statement of the thesis, of the reason, and also of the example. Praśastapāda (circa 450–500 AD) made a very significant comment in his *Padārthadharmasaṃgraha*, while he was explaining the five-step verbal articulation of the Nyāya demonstration. The last step is a re-statement of the thesis and, hence, the opponent obviously points out that it is redundant, for the thesis has already been stated and that it is proven by the adequate reason. The thesis is stated in the first step and the reason in the second step. Hence, says Praśastapāda, if we depend upon what is presented not simply verbally but also by implication as well as the significance of what is presented verbally (compare *arthāt*), then one can only state the first two steps and satisfy the other (opponent) side. We quote (1971: 241):

> Therefore, after stating the thesis, one should verbally articulate only the reason. For intelligent people will be reminded of the invariance based upon prior observation of co-presence and the lack of it (in suitable examples), and therefore they will acknowledge the thesis as established. This verbal articulation should end here (with the statement of the reason).

This was apparently a challenge to the Buddhist to bring down the number of steps in the argument from three to the first two: the thesis and the reason. It is interesting that Dharmakīrti boldly accepted the challenge and said:

For intelligent people only the reason would be stated (PV II.2).

There may be a chronological problem here, however. Praśastapāda is considered to be a junior contemporary of Diṅnāga, for he assimilated all the logical developments of Diṅnāga into his re-statement of the Nyāya-Vaiśeṣika system of logic. It is also generally believed that he preceded Dharmakīrti. I accept this chronology, and my above comment is based upon its truth. If, however, it can be shown that Dharmakīrti preceded Praśastapāda, then the above statement has to be modified accordingly My argument here is not concerned with this issue, however, and the chronological controversy would not upset anything else I have said here about logic. It is significant to note though that Udayana quotes the relevant line of Dharmakīrti while he comments on this particular passage of Praśastapāda.)

3 INDIAN LOGIC VERSUS WESTERN LOGIC: DIFFERENCES

If one were to ask at the outset, what is the difference between so-called Indian logic and Western logic, the question would be almost a non-starter. We may put a counter question: "What *is* Western logic?", and thousands of conflicting answers are available from the text books since the time of Aristotle. There is, however, a "modern" conception of logic, and we may try to spell out the difference between Indian conceptions of logic and this. In the broadest terms, one may note briefly the following differences.

First, certain *epistemological* issues are found to be included in the discussion of what we wish to call "Indian logic". The reason is obvious. Indian logic is primarily a study of inference-patterns, and inference is clearly identified as a source of knowledge, a *pramāṇa*. So the study includes general questions regarding the nature of the derivation of knowledge from information supplied by evidence, which evidence may itself be another piece of knowledge. Epistemological questions, however, are deliberately excluded from the domain of modern logic.

Second, to a superficial observer, discussion of the logical theories in India would seem to be heavily burdened with psychologistic and intuitionistic terminology – a feature which, since Frege, logicians in

the West have tried carefully to weed out from modern logical discussions. Yet the role of psychology, how one mental event causes another mental event or events and how one is connected with the other, seems to be dominant in the Indian presentation.

The Indians psychologized logic, but perhaps without totally committing the blunder into which an emphasis on psychology may often lead. Thus one may claim that they psychologized logic, without committing the fallacy of psychologism. Alternatively, the claim could be that this was a different conception of logic, where the study of the connections between mental events and the justification of inferentially-acquired knowledge-episodes is not a fault (for a development of this idea, see Matilal 1986, §4.7).

Third, historically, from the time of the Greeks, the mathematical model played an important part in the development of logic in the West. In India, it was grammar, rather than mathematics, that was dominant, and logical theories were influenced by the study of grammar. Why this was so is a question that we cannot answer. This point is to some extent related to the second.

Last but not least, the usual distinction, so well entrenched in the Western tradition, between deduction and induction was not to be found in the same way in the Indian tradition. The argument patterns studied were at best an unconscious mixture of the two processes. Yet it seemed that these mixed patterns were not very far from the way human beings across cultural boundaries would tend in fact to argue or rationally derive conclusions from the available data or evidence or premises.

This last point needs to be emphasized for another reason. Almost all modern treatments of the character of the argument pattern in Indian logic have tended to analyze it as a form of *deductive* reasoning. At best, this might have contributed to an appreciation that forms of rationality in classical India, to the extent they are reflected in the "logical" argument patterns, were not very different from what they re in the West. However, it has also undermined certain unique features of the Indian argument patterns, or at least blocked our clear understanding and appreciation of such features.

One reason for this confusion of modern scholars is that the *inferred* conclusion in the Indian theory was regarded as a piece of knowledge (derived normally from the observation of adequate evidence), and hence it was accorded that certainty which we usually associate with states of knowledge. Inductive conclusions by contrast are, in today's terms, only probable, although they may sometimes

have a very high degree of probability. The inductive element of the argument patterns studied by the Indian philosophers has thus often been lost sight of by modern scholars who emphasize the alleged certainty of the inferred conclusion, and then go on to equate the Indian argument patterns invariably with deductive or syllogistic forms.

Let me develop this point further. Since the time of Stcherbatsky, Randle, and others, and even still today, the typical example of the model of inference in Indian logic is reformulated as follows:

A Wherever there is smoke, there is fire.
There is smoke on the yonder hill.
Therefore there is fire there.

A is clearly an example of the form that we call *Barbara* in traditional Aristotelian Logic. In modern first order predicate logic, it would be an example of an inference schema which uses universal instantiation, and would have the form (see Quine 1961).

$$\{(x)\ (Fx \supset Gx) \quad Fa\} \supset Ga.$$

A is derived from, and hence regarded as transformationally equivalent to, the following presentation of the argument, which is the one *actually* used in the Indian texts:

B The hill is fire-possessing.
Because it is smoke-possessing (or because of smoke).
For example, the kitchen.

The idea being considered is that whoever asserts *B* means exactly *A*.

The common reconstruction of the Indian argument pattern, *B*, is in fact more often presented, not exactly as *A*, but as

*A**: Wherever there is smoke there is fire, *as in a kitchen*.
There is smoke on the yonder hill
Therefore there is fire there.

The argument pattern *A* undergoes, however, an often unnoticed but important metamorphosis when it is presented as *A**. The citation of the example, "kitchen" underscores first of all the fact that unlike the first proposition in *A* (or Aristotle's universal premise) the premise here is unambiguous. For the schema "$(x)\ (Fx \supset Gx)$" in *A* represents any universal proposition *with or without existential presupposition* (for the problems related to the existential import of the subject term of universal propositions in Aristotle, such as "All *S* is *P*" or "All *F*s

are *G*s", one may consult P. F. Strawson, 1952). However, the citation of an example in the first proposition of *A** shows that it is a universal proposition along with existential import. In other words, the subject term now is definitely non-empty.

In the above *A**, and in *B*, the insistence on the presence of an example should thus not be lightly dismissed as an inessential detail. For it brings to the fore the inductive nature of the first premise, and thereby exposes the "weakness" of the entire argument pattern from a purely deductive point of view. The Indian philosopher of logic did not generally think of this feature as an indicator of the weakness of their theory of inference (although the skeptics, as well as the Cārvāka or the Lokāyata, who were opponents of the idea that inference is a source of knowledge, severely attacked the theory just on this ground). To counter this attack, the Indian logicians sought some way to accord the conclusion of this type of argument almost the same degree of certainty that is given to the conclusion of a normal deductive argument. However, the point remains that the importance attached to the citation of an example in the Indian schema, *B*, highlights the fact that it cannot be reconstructed as a purely deductive argument, along the lines of *A*.

It is a commonplace in modern logic to distinguish between truth and validity. Roughly, validity has to do with the rules of inference in a given theory. The conclusion may be validly derived from the premises, if and only if the rules of inference are not violated, while it may still be a false judgement. The soundness of the conclusion in deduction depends also upon the adequacy or the truth of the premises. It is now-a-days claimed that a logician's concern is with the validity of inference, not with its soundness, which may depend upon extra-logical factors (the truth of the premises). This is the ideal in formal logic. In India, however, this distinction was not often made, for the philosophers wanted their "logically" derived inferences or their conclusions also to be pieces of knowledge. Thus, validity must be combined with truth. It was allowed that some wild guesses or "invalidly" derived inferences might happen to be true. Such "invalid" derivation, however, would not be a proper route to knowledge.

The point just made is that Indian logic is not formal logic. This does not imply, however, that by introducing some aspects of formal logic in order to interpret the Indian theories we cannot gain any sort of deeper understanding of Indian logic. In fact, we can. Hence, reductions to Aristotelian syllogistic inference along the above lines, and even modified use of Venn diagrams (for example, Chi 1969),

have very often been fruitful in our attempt to understand, analyze and explain the Indian theories, as long as they are taken in context.

Let me develop this point a little further. Since Łukasiewicz, it has been fairly well-known in the West that Aristotle's syllogistic need not be interpreted as resting on an ontology of individuals and the mechanism of quantification. It can be seen instead as involving four operators "A" "E" "I" and "O", treated as primitives, holding upon variables "*u*" and "*v*" which range over non-empty terms (which stand for properties or sorts). This dispenses with the standard logical subject-predicate analysis of sentences, in which the subject identifies an object and the predicate sorts (is true of) that object. Modern logic in the Fregean tradition, on the other hand, requires, in its semantics, a domain of individuals, to which are attached properties and relations. Likewise, by subjecting the inference-patterns formulated and studied in the logical texts of India to various different reductions and translations, we might get closer to the nature of Indian logical theories, provided we remain cautious and sensitive to the peculiarities and differences. Venn diagrams, rules of propositional and first order predicate logic, some issues from the logic of classes and relations – all these can be used in our study, if only to underline the differences and uniqueness of Indian logic.

As far as the inductive character of the Indian argument pattern is concerned, it is reminiscent of J. S. Mill's theory of inference and induction. Presently we will see how the general premise is supposed to be supported by a positive as well as a negative example, called the homologue (*sapakṣa*) and heterologue (*vipakṣa*). This invites comparison with Mill's Joint Method of Agreement and Difference, which is regarded as stronger, in its power to generate certainty or high probability, than either the Method of Agreement or that of Difference, when employed independently. Mill, however, obtains certainty by implicitly basing his theory upon a presumed relation of strict and necessary causation between the observed and inferred properties, thereby ruling out accidentally true generalizations. Indian argument patterns too were initially based upon a number of ontological relations, causation, part-and-whole, essential identity and so on, and this feature justified the so-called assumption of certainty or knowledgehood of the inferred conclusions. However, the history of inference unfolded differently in India, for there it took the form of a search for a logical, that, inference-warranting relation, which was called *vyāpti* – "pervasion" or "concomitance," between the evidence and the conclusion.

We may conclude this section with a quotation of H. N. Randle, who, incidentally, wrote a paper on Indian logic long ago in the journal *Mind* (Randle, 1924; this volume, Essay 3). In his book, *Indian Logic in the Early Schools*, published by Oxford University Press in 1930, he said:

> Indian formalism in fact seems to break off abruptly at the point at which western formalism begins, perhaps by a fortunate instinct. (1930: 233, fn. 3)

He was obviously no lover of formal logic, and perhaps would have been surprised by today's development in the area of formal logic in the West. However, he continued:

> But if formal logic is admitted to have a certain methodological value – I think it is as good a mental discipline to turn [Diṅnāga's] wheel of the reasons as to plough the sands of Barbara and Celarent. The study of either logic is almost a necessary introduction to the philosophical literature of either civilization. (ibid.)

The world of philosophy and scholarship has moved a long way since the days of Randle. Still, what he said in the concluding sentence of the above passage is very true even today.

4 SOME GENERAL CHARACTERISTICS: SUBJECT AND PREDICATE

Any study of logic is intimately connected with the language in which it is conducted. Needless to say, the Indian "logicians" did not use symbols, formulae, or axiomatic constructions in an artificial or formal language. Indian logical theories were discussed primarily in Sanskrit, and the structure of the Sanskrit language figures prominently here. This fact has created some problems of interpretation, for it is extremely difficult, though not impossible, to transfer the philosophical and logical problems from the narrow confines of Sanskrit to the modern philosophical audience in general.

It is commonplace in logic to talk about the analysis of propositions. In the context of logic in Sanskrit, we have to talk about the analysis of Sanskrit propositions. A Sanskrit proposition is what is expressed in a Sanskrit sentence. It will appear that the analysis proposed by the early Sanskrit writers would not be entirely unfamiliar to one accustomed to the usual subject-predicate analysis

of modern or traditional Western logic, nor is it unrelated to it. However, the logical as well as grammatical analysis of Sanskrit sentences presents some significant contrasts with the usual subject-predicate analysis. Unless these points of contrast are noted, it will be difficult to appreciate fully some of the concerns of the Sanskrit logicians.

A sentence in Sanskrit is regarded as the expression of a "thought" or what is called a cognitive state (*jñāna*), or, to be precise, a qualificative cognitive state (*viśiṣṭa-jñāna*). A simple qualificative cognitive state is one where the cognizer cognizes something (or some place or some locus, as we will have to call it) as *qualified* by a property or a qualifier. It is claimed by most Sanskrit writers that to say that something or some place is qualified by a qualifier is equivalent to saying that it is a locus of some property or "locatable." As I have discussed elsewhere (Matilal 1968, 1971), a qualificative cognition is actually to be thought of as a propositional cognition or a judgement. In this and subsequent sections, we will investigate how the Indian analysis of the structure of such states relates to Western analyses of the subject-predicate distinction.

A proposition, in its basic form, is usually explained by Western writers in terms of what we call a *predication*. A simple or atomic proposition is thus better understood as involving the – "basic combination" – of predication. This expression "basic combination" was once used by W. V. Quine (1960: 96). The idea was sharpened by P. F. Strawson (1974). Strawson explains the structure of the so-called basic combination of predication as (1) a combination of (2) a subject and (3) a predicate, and said that it lies at the focal point of our current logic. He has further claimed that:

> [i]f current logic has the significance which we are inclined to attach to it, and which our contemporary style of philosophizing in particular assumes, then it must reflect fundamental features of our thought about the world. (1974: 4)

The claim may be too strong. For all we can say is that the said structure reflects primarily the basic way in which we are accustomed to think about the world. We might be trained and then be accustomed to think about the world in a different way, but in that case our language would not admit a predominantly subject-predicate structure. This is at least conceivable. In Jonathan Swift's *Gulliver's Travels*, three professors of the School of Languages at the Grand Academy of Lagado, were trying to work on a project that would

shorten the academic discourse by leaving out, among other things, "verbs and participles, because in reality all things imaginable are but nouns" (p. 219, 1919 edn.). The point is that while a project need not be a radical or outlandish as this one, even a slightly different proposal may appear odd or queer to our readers today who are well-accustomed to modern quantificational logic as well as the subject-predicate analysis of the basic sentences.

The "current" logicians generally agree that the basic predication may best be pictured in the neutral logical schema "*Fa*." It represents a combination of a singular term or a (proper) name and, to use Quine's terminology, a general term or a *predicate*, a combination which forms a sentence. By "general term" are meant such grammatical terms as substantives, adjectives, and verbs. (Even names or so-called singular terms can by systematically reparsed as *predicates* by following the Russellian trick of representing them as descriptions. However this part of Quine's proposal is controversial and may be ignored for the moment). Verbs, according to Quine, may be regarded as the "fundamental form" of predication, and the adjectivals and the nominals (substantives) may be assimilated into the "verbals." In other words, such phrases as "... is an *F*" and "... is *F*" are mere stylistic varieties of the verb form "... *Fs*." Predication, then, is illustrated indifferently by "Mama is a Woman," "Mama is big," and "Mama sings" (1960: 96).

Strawson analyses the "basic propositional combination" as a tripartition of function, as I have already noted. This is represented by a simple symbolism "ass *(i c)*," where "*i*" represents a particular, "*c*" the concept specification and "ass *( )*" the propositional combination. The former two underline the duality, that, following Strawson, we may still call the subject and the predicate, while the isolation of the third element is important to capture the function of presenting the particular and the general concept as assigned to each other in such a way as to have a propositional combination. In our "ground level" subject-predicate sentence, the third function is usually associated with the second. Hence the *predicate* is usually a verb or a "verbal phrase," that combines syntactically the concept-specifying element and the indication of propositionality.

This dual role of our ordinary predicate phrases must be recognized, even if we try to maintain Quine's strictures against the predicate-term being accessible to quantifiers or the variables of quantification. Apart from worries about ontological commitment to abstract (in Quine's words, intentional) properties, there does not

seem to be any good reason why we cannot quantify over the predicate-properties which are denoted by singular abstract terms such as "sweetness" or "singing."

Now, in the Indian context, the basic combination is not called a proposition. It is a structured whole that is grasped by an atomic cognitive event. We call it an atomic *qualificative* (*viśiṣṭa*) cognition. One element is called the *qualifier* while the other the *qualificand*, and their combination forms the structured whole. It can be represented by:

$$Q\ (a\ b)$$

where "*a*" represents the qualificand, "*b*" the qualifier, and "*Q( )*" the indication of "qualificativity." I shall be using these symbols for convenience only, as I have done in my earlier writings (especially Matilal 1968). One can read "*Q (a b)*" as "*a* qualified by *b*." The similarity of this symbolism with Strawson's "ass *(i c)*" may not be only superficial. As far as the separation of the syncategorematic element of a given combination is concerned, both agree. Both leave us open to treat the "predicate" element as a singular (abstract) property. For the cognition of a blue pot can be expressed either as a sentence ("This pot is blue.") or as a phrase ("this blue pot"). Besides, our symbolism admits the following two basic rules:

(1) $Q\ (a\ b) \cdot Q\ (a\ c) \rightarrow Q\ (a\ (b\ c))$
(2) $Q\ (a\ b) \cdot Q\ (b\ c) \rightarrow Q\ (a\ Q\ (b\ c))$.

"*Q (a (b c))*" can be read as "*a* is qualified by both *b* and *c*" and "*Q (a Q (b c))*" as "*a* is qualified by *b*, and *b* in its turn is qualified by *c*."

Qualifier versus Predicate-Property

A qualifier and a predicate-property may not always be the same, such that we can say that there is only a terminological variation. In fact, an Indianist would like to say that not all predicate-properties are qualifiers nor are all qualifiers predicate-properties. This is not simply because in an expression such as "there lies the blue pot" the qualifier, which is the blue pot, would probably not be called a predicate-property. Even if we concede this, still, in a given situation, a predicate-property. Even if we concede this, still, in a given situation, a predicate-property, that is, what the Indianist would call a *vidheya-dharma*, may not be the same as the qualifier property (*viśeṣaṇa*).

Let me illustrate this point. Suppose I wish to infer a property, *s*, as belonging to a given locus, *p*. Naturally the inferable, for example, the to-be-inferred property (*sādhya*), would be the *vidheya-dharma*, for example, the predicate-property. According to our basic intuition, the subject is what is being talked about and the predicate is what is being talked about it. Sometimes, it has been said to be a distinction between *that* and *what*. Consider now the following two "propositionally equivalent" verbalized expressions, representing two numerically different knowledge-episodes:

(a) Sound (noise is impermanent (that is, impermanence-possessing).
(b) Impermanence resides in sound (noise).

The qualifier in the first is impermanence, while in the second, it is residence-in-sound. The qualificand in (a) is sound but in (b) impermanence is the qualificand. Thus, the qualifier-qualificand distinction is always related to the structure of some knowledge-episode or qualificative cognition. However both (a) and (b) can alternatively be reached as inferred conclusions, for example, as the resulting knowledge-episodes of a process of inference. In either case, the to-be-inferred property, that is, the predicate-property, remains the same, impermanence. For, it does not matter whether (a) is reached or derived from the knowledge-episode (premise), "sound has product-hood which is pervaded by impermanence" or (b) is reached from "product-hood which is pervaded by impermanence resides in sound;" in either case, it cannot be denied that impermanence is the property we wish to establish by the inference. This may lead one to believe that the qualifier-qualificand distinction is perhaps closer to a subject-predicate distinction conceived as based upon a grammatical criterion (cf. Strawson 1974), though even this could be misleading.

5 A SKELETAL THEORY OF INFERENCE

The last point may appear a bit enigmatic unless we give an account of a skeletal theory of inference in the context of Indian logic. This skeletal theory seems to be presupposed, consciously or unconsciously, in all the representations of inference-patterns in India, although it became more explicitly formulated somewhat later in the history. I shall present it as a theory of substitution, where one property, by virtue of its logical relation with another property, forces the substitution of the latter in its place. That is (taking "*p*" to stand

for the locus or *pakṣa* of the inference, "*h*" for the reason-property or *hetu*, and "*s*" for the to-be-inferred property or *sādhya*:

(1) There is *h*-pervaded-by-*s* in *p*

leads to:

(2) There is s in *p*.

Alternatively,

(3) *p* has *h* pervaded-by-*s*

leads to:

(4) *p* has *s*.

In an historically earlier version, found in the *Nyāya-sūtra* and other contemporaneous texts, this was formulated as:

(5) There is *h*-connected-with-*s* in *p*

leads to:

(6) There is *s* in *p*.

The spelling out of "connected-with-. . ." in terms of "pervaded-by. . . " was how progress in the history of Indian logic was achieved, among other things. We will have occasion to come back to the various ways in which the phrase "connected-with-. . . " as well as "pervaded-by. . . " were expanded.

To add flesh to this skeleton, I give an example:

(7) Sound has product-hood-connected-with-impermanence

leads to:

(8) Sound has impermanence.

This is an elaboration, presumably with minimized distortion, of the following:

(9) Sound has impermanence, because of its product-hood.

As we have seen in §3, (9) has generally been transformed, by almost all modern interpreters, into a proto-Barbara:

All products are impermanent.
Sound is a product.
Therefore, Sound is impermanent.

Or, sometimes, it is rendered as:

Whatever is a product is impermanent.
Sound is a product.
Therefore, Sound is impermanent.

This is equivalent in structure to the schema *A* in §3. Our "substitution" model, however, follows more closely the actual analysis offered by the Indian logicians. With this skeletal model before us, we can now look more closely at the qualificand-qualifier distinction and its relation to the subject-predicate distinction.

6 MASS TERMS

The Sanskrit logicians tried to explain the structure of the "atomic" qualificative knowledge with a model that I have earlier called the "property-location" model. This, in some respect, resembles what Strawson (1959) has described as a "featuring-placing" language. In a "feature-placing" language, Strawson notes, the subject-predicate distinction has no place. The model sentence would be something like "ϕ is here" or "there is ϕ here now." One advantage here is that this language gives place-and-time-identifying expressions the status of what are called logical subject-expressions, and spatial and temporal regions take the place of ordinary particulars. There are serious limitations of such a language, as have been discussed by Strawson, although he has pointed out that, in a feature-placing language, "we can find the ultimate propositional level we are seeking (Strawson 1959: 209)." In the above, we have seen that the Sanskrit logicians concentrated upon a structure of knowledge-episodes that is akin to this form, for the locus, *p*, can be (in fact, has been) interpreted as a spatio-temporal location, where the to-be-inferred property, *s*, is to be located. In one formulation (see Diṅnāga's texts) the word "*atra*" is explicitly used. This means "here" or even "here/now," if the understood verbal element ("*asti*") is in the present tense.

W. V. Quine, while he was discussing the category of "mass terms" (a phrase coined by Otto Jesperson), which resemble the "feature-universals" of Strawson, remarked that these mass terms represent a primitive, archaic survival of a level of thought, the one developmentally where the baby has not apparently learned to identify particulars. Of course, the assumption involving baby-psychology is open to question. However, the point is that our adult language

retains a considerable number of *mass* terms. Moreover, the category of mass terms has been the "problem child" of quantification theory, for the referents of these terms do not easily yield to individuation and hence we cannot quantify over them.

The problem of fitting mass terms to quantification, or "feature-words" to sortals, is a genuine one. Quine's proposal has particularly been under attack, for example by T. Parsons (1970), R. Sharvey (1978, 1979), and Helen Cartwright (1970). J. van Heijinoort (1974) has argued that the grammar of the mass-term is "far from being a negligible side-show" (p. 264), for "stuff-talk is an important part of our language, parallel to object talk" (p. 265). It has been noted that in modern physics there has been "the true systematization of stuff-ontology" (p. 266). It has further been noted that abstract terms are also "much-terms," that is, the grammar of abstract terms, such as prettiness and courage, is similar to the grammar of mass terms. Sometimes it has been facetiously remarked that English may not have real "count names" (Sharvey). A. N. Prior once suggested (1976: 183) that "possibly all things are, or can be said to be made of stuff."

Our stuff-talk can be connected with property-talk, for there seems to be an obvious connection between stuff-ontology and property-ontology. Suppose by "property" we mean non-universal, abstract features, or even tropes, for example, the property of being a swimmer or the ability to swim. This will be a non-universal, if we believe, as we probably should, that this ability to swim varies from person to person, for there may not be a single objective property that we can talk about here. This will then be a perfect example of what the Nyāya call an "imposed" property or *upādhi*. The use of the same expression "ability to swim" would then be like the use of the term "water" for water found in different spatio-temporal locations, as the river-water now is different from the water in this glass.

Consider a thought experiment. We may mentally integrate the individually located water stuff in this world into a spatially integrated whole. "Water" then becomes a singular term referring to this whole, which has a spatio-temporal spread. Then to talk about the water in this glass we can delimit the stuff by its spatio-temporal location. We can likewise conceptually integrate all the different abilities to swim that are found in various agents into a "conceptual spread," and to talk about John's ability to swim, we can delimit this abstract feature, the ability to swim, by its spatio-temporal location, in this case, John.

The purpose of this exercise has been to show that the problem of individuation of a stuff like water is similar to that of an abstract feature, or a non-universal property. Thus, consider:

(1) The water in this glass is cold, and

(2) John's ability to swim is poor (from: John is a poor swimmer).

The Sanskrit logicians would see them as equivalent to the following analyses:

(3) Water, which is characterized by being a locatee, where such locatee-hood is conditioned by a location-hood resident in the glass, has coldness (or is cold-ness possessing).

(4) The ability to swim is characterized by being a locatee, where such locatee-hood is conditioned by a location-hood resident in John, has the quality of being poor.

In both cases, we have to add also that the locatee-hood is delimited by the present time. This can be further sharpened to take care of other well-known indexicals.

7 PROPERTY: LOCUS AND LOCATEE

I have been suggesting that a "property-location" model best suits the arguments and inference-patterns studied in Sanskrit. What is this model? As we have noted, to some extent it appears to be similar to the imaginary language called the "language without particulars," or "feature-placing" language, which was described by Strawson (1959). He has also pointed out the limitations of such a language. The Sanskrit logicians' language is not exactly the same, there being important differences which will be noted presently. It is not clear, however, whether, in virtue of these differences, the language studied and developed by the Sanskrit logicians would overcome the alleged difficulties faced by feature-placing languages.

First, a terminological problem: using the word "property" as a translation of the Sanskrit word "*dharma*" has rather unfortunate consequences, for the word "*dharma*" has a wider extension than the word "property," and also has many non-logical connotations. But the situation need not be regarded as hopeless. "*Dharma*" sometimes means not only abstract properties or universals but also concrete features, that is, the particular features of some object or locus.

"*Dharma*" and "*dharmin*" constitute a pair in Sanskrit that is equivalent to the pair "locatee" (or the locatable) and "locus" (location, which may be a place or a time or even an abstract object). What Strawson called a "feature" would be a locatee on this view.

A particular property is not a "property-particular," but a locatee (or a locatable) can be a particular in the sense of being a unique characteristic of a singular locus: for example, sky-hood belonging to the sky, and the sky only. The particular feature of a person would be her unique *dharma* or a locatee of which she is the locus. However, *dharmas* in Sanskrit include not only qualities like color and shape, attributes like the motion of a moving body, abstract universals like pot-hood or cow-hood, but also the concrete substantial masses like the particular body of water or fire, or even such concrete objects like a post or a rock!

It is the last two groups of *dharma* or locatee that would call for some explanation. It would be very difficult to call them "properties," if we followed the conventions of the English language. That is why I have chosen terms like "locatee" or "the locatable." Consider the following sentences:

(1) There is black ice on the road.

(2) There is fire on the hill.

(3) There is a pot on the ground.

These three would be transformationally equivalent to:

(4) The road has black-ice on it, or, the road is black-ice-possessing.

(5) The hill is fire-possessing.

(6) The ground is pot-possessing.

The expressions (4)-(6) clearly underscore the locus-locatee model by combining two particulars, if we rephrase them as:

(7) Some black-ice is located on the road.

(8) Some (body of) fire is on the hill.

(9) Some (indefinite) pot is on the ground.

Here the left-hand side gives the locatees and the right hand side the loci. This is not a language without particulars, rather a language with particulars only, the universal element being implicitly present only in

the relational factor – the combiner of locus and locatee. The Sanskrit linguistic intuition would allow us to call the three elements, black-ice, fire, and a pot, *dharmas* of their respective loci (*dharmins*). But we cannot call them properties, according to the ordinary linguistic intuition of English. For it is counter-intuitive to call a pot a property of the ground on which it is present. Let us see why.

The logical language in Sanskrit was obviously influenced by the grammatical analysis of the Sanskrit language. This is a thesis which scholars like Staal and Faddegon formulated, though they never cited any cogent argument in its favor. Certain grammatical operations are particularly relevant here: namely, use of the location suffixes and the reciprocal use of the possessive suffixes. We can say, "There is a pot on the ground" (= *bhūtale ghaṭaḥ*) which is equivalent to "The ground (is) pot-possessing" (= *ghaṭavad bhūtalam*). This equivalence in Sanskrit is much like the equivalence between passive and active constructions in English. The expression "pot-possessing" is a bit odd, and sounds artificial in English due to the paucity of possessive suffixes in English. One may think of "health" and "healthy" or "wealth" and "wealthy," but these are rare. On the other hand, "*ghaṭavad*" (= pot-possessing) seems as common in Sanskrit as "sweet" or "blue", or other such adjectival expressions.

A predicate expression, in the canonical notation of Quine, is syntactically akin to a verb since it combines the double function of specifying a general concept and a propositional combination. If a predicate expression is taken to be a sortal, then it is syntactically akin to a common noun. The nominal "man" or "pot" specifies a general concept that supplies the principle of individuating the particulars it collects. Analogically, we may speak of the predicate expressions of the Sanskrit logicians as syntactically akin to the adjectivals. Adjectives are usually found without articles or plurals, although there are certain clear cases of adjectives that specify sortal universals, or to use Quine's term, terms which "divide their reference", for example the term "spherical."

Adjectives and mass terms (feature-words) share some grammatical properties. However the received opinion has been that we will be better off by assimilating the adjectives into general terms, whose paradigms are sortal-terms. The grammar of our adult language provides us with the mechanism of deriving an abstract property from each adjectival. This is as much true of a natural language like Sanskrit as it is of English and Latin. Thanks to the predominance of "have" verbs in English or Latin, use of abstract singular terms

derived from adjectives or nouns does not sound odd in such languages. Thus "*a* is *f*" or "this mango is sweet" can be easily rephrased as "*a* has *f*-ness" or "this mango has sweetness." In Sanskrit the "have" verb is usually missing. But the use of genitive and locative suffices makes a smooth transition from the adjectival to the abstract singulars possible, for example:

(10) *paṭo nīlaḥ* (= The cloth (is) blue)

(11) *paṭasya nīlimā (asti)* (= The blue colour *of* the cloth is there)

(12) *paṭe nīlam (asti)* (= There is blue colour *in* the cloth).

Although these are equivalent, (11) seems to particularize the general concept "blue color," that is, the locatee.

The most common form of the substantive suffix in Sanskrit is *-tva* or *-tā* (comparable to English "-ness" or "-hood"). This mechanism of substantivization turns both adjectivals and nominals into words expressing the so-called abstract locatables. And a locatee-word can easily be turned into an adjectival by the use of possessive suffixes, *-vat*, *-mat* and *-in*. Sanskrit logicians use this double mechanism of substantivizing and possessive suffixes to assimilate the usual subject-predicate sentences into their locus-locatee model. Thus:

(13) The mango is sweet

becomes

(14) The mango is sweetness-possessing.

Remember the maneuver from (4)–(6) to (7)–(9). Can we do the same maneuver in (14)? (14) would then be:

(15) (There is) sweetness-possessing-ness in the mango,

or

(16) (There is) sweetness in the mango.

We are back to the locus-locatee model, where here the locus = the mango, and the locatee = sweetness-possessing-ness = sweetness. So far very few would object to the equation – sweet-ness-possessing-ness = sweetness. Can we generalize it? Can we say:

(17) x-possessing-ness = x?

Sanskrit logicians argue that the two operations – use of possessive suffix and substantivization – are reciprocal to each other. Hence,

(18) $x + vat + tva = x$,

(*tadvattvaṃ tad eva*). If we accept this, then we have to allow such equations as:

(19) Fire-possessing-ness = fire.

(20) Pot-possessing-ness = pot or (a pot?).

This means that as locatees or *dharmas*, it does not make a difference whether we say "fire-possessing-ness" or "fire." On the other hand, ontological worries not withstanding, one may call pot-possessing-ness a property of the ground, but not "pot" or a pot. But as locatees, *dharmas*, there is not much difference! That is, at least, the claim by the Sanskrit logicians. The Sanskrit grammarians who discuss the meaning of the suffixes such as *-tva* and *-vat*, would support such conversions

The oddity of this claim must be explained further. The expression "pot-possessing" is an adjectival or what Strawson calls a *g*-word. Hence it is on a par with "sweetness-possessing." We may accept "sweetness-possessing-ness" as being conveniently abbreviated as, or equated to, "sweet-ness," for both denote in some sense, abstract properties. But (19) and (20) do not seem to be acceptable equations because not only is a pot or fire a "concrete" object (as in "a pot is blue" or "fire burns") but even their predicative use ("This is a pot" or "This is fire") introduces a sortal universal, a concept, that applies to an object that the subject term is supposed to identify. The proposal of the Sanskrit logicians seems to be one for a third use of such terms, distinct from "pot" in the subject place or the predicate place. The word in (20) introduces a locatee – a non-particular *potty* feature of some locus. The word "fire" in (19) then introduces a locatee – a fiery feature, or fire-presence. We may recall here that Quine has remarked that the feature-words or the mass terms have the "hybrid air of abstract singular terms." We may substitute "genuine" for "hybrid," for a locatee such as fire may be a quasi-abstract entity. The word "pot" in (20) may then be regarded as indicating a *potty* substance or pot-presence, to bring it closer to fire, a feature as in (19).

We have thus clarified what the Sanskrit logicians meant by *dharma* and *dharmin*, the locatee and the locus. We may translate *dharma* as "property" only out of politeness. But to do justice to such cases as (19) and (20), we may use "locatee" or "the locatable." This

category of the locatee seems to include not only general attributes, but also abstract and quasi-abstract entities. If the expression "pot" seems awkward we may make it "pot-presence." In fact, what I call the presence-range and absence-range of such locatees or *dharmas* would be more useful in the formulation of the rules of inference in this language.

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